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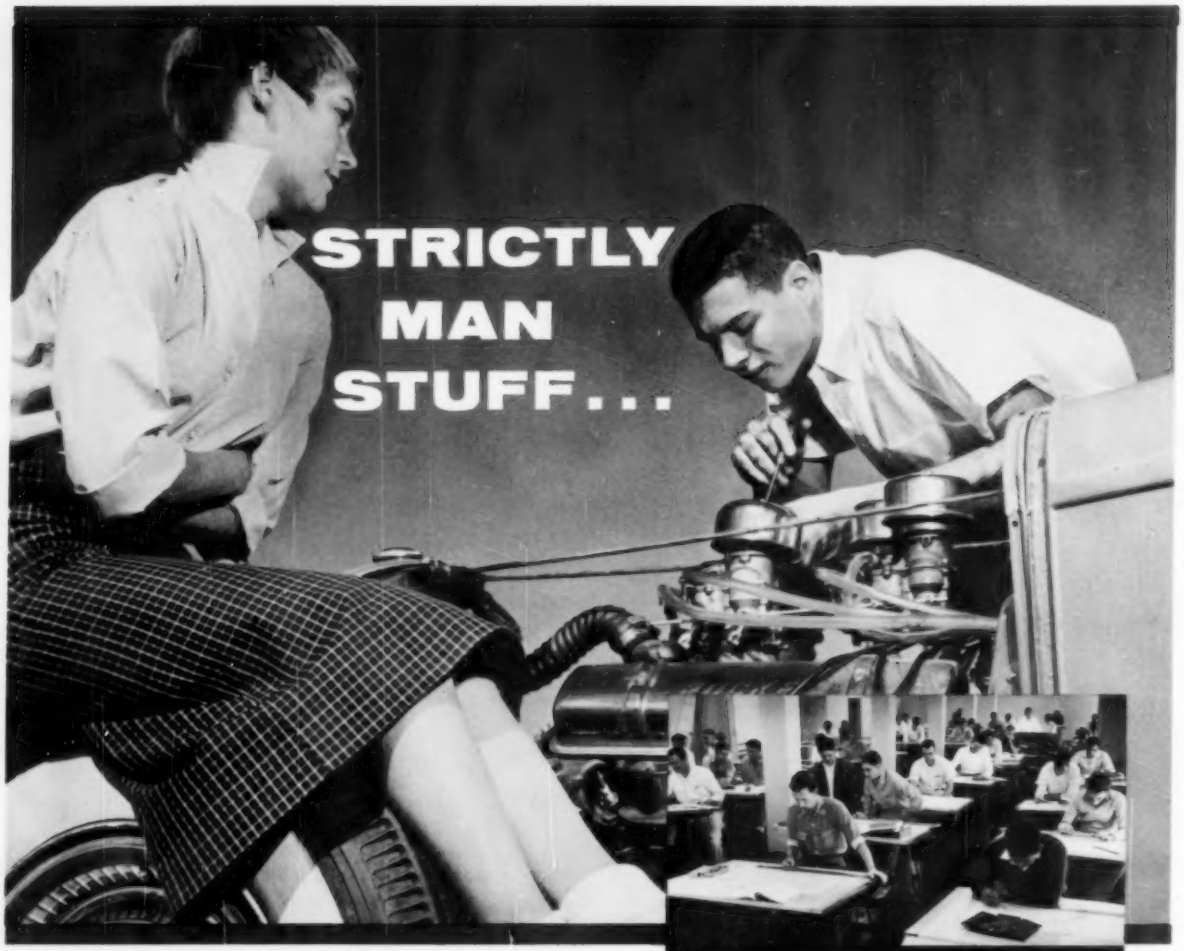

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AUGUST, 1958 VOLUME 63, NUMBER 2

THE COVER: Colonial Aircraft's Skimmer IV amphibian was photographed by Hans Groenhoff over Miami Beach. Read Check Pilot Report on page 40.

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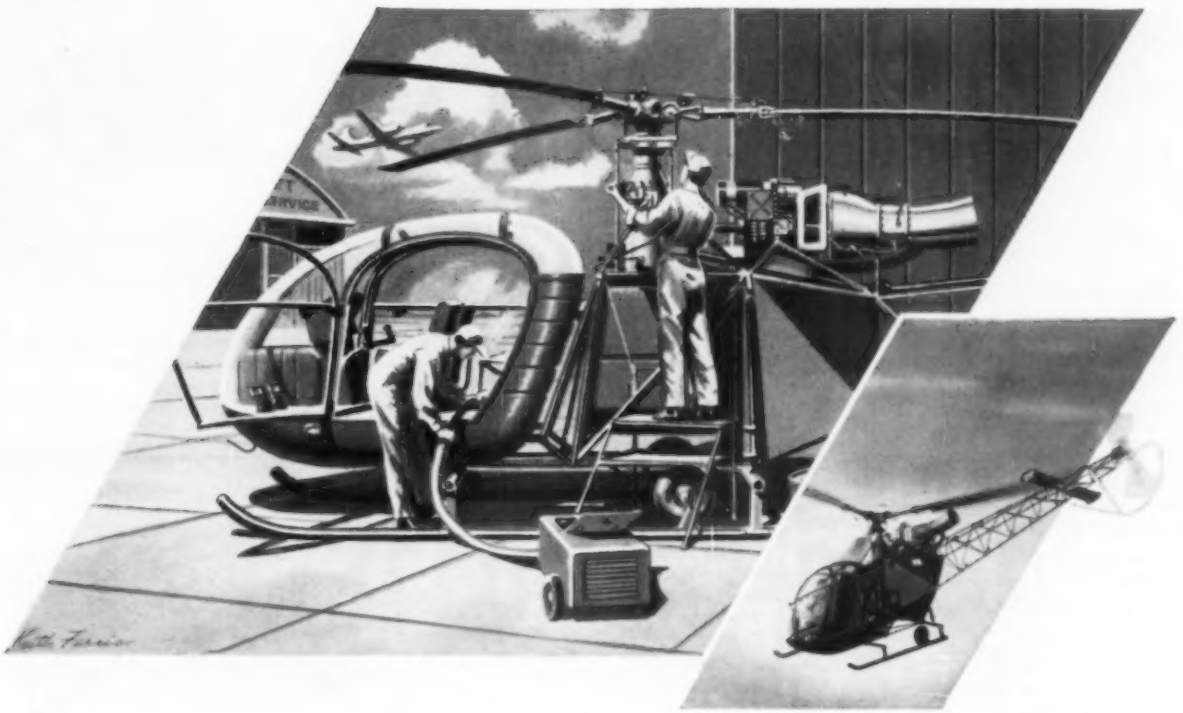
ALOUETTE ECONOMY
FOR COMMERCIAL TRANSPORT



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NAUGLE AND TUTTLE

It is with pleasure that I write you these short lines to congratulate you on the June issue. I particularly appreciated Mr. Naugle's article "A Designer Looks At The Small Plane" and Mr. Tuttle's "The Inexperienced Pilot and Weather Accidents." How about more such technical items . . . ?

ALAIN CORNELLIER

Montreal, P.Q., Canada.

• *As we get them, we shall print them.* —ED.

SUPER CUBS AND HELIOS YET

How come all the oohing and ahing about so and so, 'the world-famous glacier pilot' (January issue) doing this and that on the glaciers with his Super Cub and Cessna 180? This sort of thing might be new and unheard of to 'cheechakos' but not to Alaskans. Bob Reeve was doing this kind of flying 25 years ago and he wasn't doing it in STOL aircraft like the Helio Courier, the Super Duper Cub or the Cessna 180. You can well imagine what was around to do this type of flying 25 years ago.

I've also done glacier flying in Alaska using not skis but pontoons. In 1951 I landed a prospector on a glacier on the Alaska-B. C., border at an altitude of about 4,500 feet — now the site of the Granduc Copper Mine—not in a souped-up Cub but rather a pooped-out Luscombe 8A on 1320 floats with a tired 65 Continental for power. This wasn't amazing, it was plain stupidity. Later I picked up the man using an Aeronca Sedan on 2,000 floats. I have also used a J-3 with an 85 hp Continental. This thing performed well enough to take off with a good sized passenger and about 60 lbs. of gear. Super Cubs and Helios yet—simple luxury on anybody's glacier!

DON ROSS

Ketchikan, Alaska

AIR-MINDED PARAKEET

. . . . Thank you for such a wonderful magazine. I look forward to it each month and read it cover to cover. Enclosed is my renewal check.

Upon completing my flight training and receiving my private ticket, I made haste to get checked out in a Tri-Pacer, the airplane I have always admired. Then on last Christmas day I rented a Pacer and took my wife and two young daughters on their first x-country for Christmas dinner with our parents.

The girls were so excited for weeks afterwards . . . they later conceived the idea of teaching their parakeet to say something concerning airplanes. As a result I think I would be pretty safe in saying that we probably have the only Parakeet who can say—"*Pilot the Piper Pacer, Pretty Boy*"!—Quite an accomplishment for a little bird who only occasionally gets out for a local flight around the house.

BILL WINKLER

Lawton, Okla.

CLASSIC EPISODE

Your retelling of that classic "brown shoe" Navy tale (Hangar Flying, May issue) warms the heart of this old Nav-Cad.

Shortly after this memorable flight, I matriculated at NAAS Saufley Field. A tape recording of the hop was used as an indoctrination aid to the tactical phase of the program.

For sheer mirth and unbridled hilarity,

this tape would rival any episode concerning man and flying machine from Icarus to ICBM.

I still recall the instructor beseeching the LSO, after the four "students" made wheels up approaches, to "next time around-shoot 'em down."

ROBERT J. LILLY

Depew, N. Y.

OUR PLEASURE

. . . . Needless to say all of us associated with the Lambert-St. Louis Municipal Airport were delighted to see that we had made the cover of the finest aviation magazine published today. Your consideration in using this airport as typical of modern aviation facilities is appreciated.

DAVID E. LEIGH

Airport Manager.

FLYING CLUBS OFFER MEMBERSHIP

. . . . Several of us here in New York have decided to save money and make flying really economical by following the lead to a group enterprise. We plan a four-place job for now and are willing to share our venture with a few more pilots or perhaps students, or maybe even someone trying to get off the ground for

(Continued on page 10)

ROYAL 760
ZENITH
"For safety's sake, every pilot should own a Navigator, and carry it with him every time he flies, particularly when IFR."
George Edgecumbe,
Piper Distributor, Elgin, Ill.

George Edgecumbe, Testing Navigator in new Comanche

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At California's Ontario International Airport, 35 miles from downtown Los Angeles, Shell dealer Les Farrar runs one of the fastest growing aviation service companies in America

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So Les Farrar teamed up with Shell 5 years ago.

Today Ontario International Airport provides rapid, efficient fueling service for commercial, military, business and private aircraft . . . in fact just about anything that flies. Growth has been rapid . . . gallonage has increased *twenty* times in the five years Les has been with Shell.

How does he do it? Les picks up valuable merchandising tips from the Shell dealer magazine. And through the Shell Aviation Specialist, Les keeps posted on new ways to build the kind of service fliers want.

A key part of his service program is the Shell Credit Card System . . . a time-saver designed to help fliers meet exacting schedules.

Business is good at Ontario. In fact it is so good that Les is looking forward to expanding his facilities. Plans include a new 2,000-foot runway extension to accommodate the ever-increasing traffic.

The fine reputation of the Les Farrar Aviation Service is widespread and still growing. As for the future? Les himself will tell you that with Shell helping him in every venture—the sky's the limit!

Round-the-clock tower and modern all-weather equipment serve the airlines, a Forestry Service fire-fighting unit, an Air National Guard unit and turn-around customers.

Studying airport expansion plans (left to right) are Art Clark, vice-president of Les Farrar Aviation Services; Thomas E. Flaherty, Airport Manager; Fred Stewart, Shell Aviation Representative; and Les Farrar.

Giant military transports come to Ontario for modification by Southern California Aircraft Corporation and Lockheed Aircraft Service Corporation. They rely on Les Farrar for fine service and Shell for high-quality fuels and lubricants.

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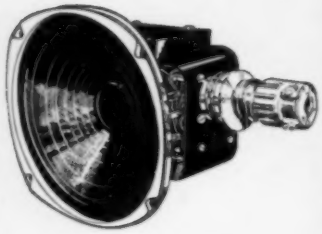

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MAILBOX

(Continued from page 6)

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JOHN T. LOOMIS
Bergenfield, N. J.

FLAPS

I particularly enjoyed the article by S. W. Hubbard, Jr. and Ted Durosko (April issue) "Get The Most From Your Flaps." The information from this article was very informative and highly interesting to read due to the fact that there are not so very many such articles published. Keep up the good work.

DAVE DOGGER
Grand Rapids, Mich.

COVER GREMLINS

You have given away our land and buildings! When Jim Taylor showed us the proofs of the June cover, we were very happy. Jim is flying Upressit Products' Beech and, we, Sadler Aircraft Service, are the buildings in the background. When we received our copy and opened to the first page and found Sadler was now the Danbury School of Aeronautics, we thought different. At first we were going to let it go, but we are receiving so much comment about our being part of the flying school, which is not so, and our customers are asking if the bills should be paid to the Danbury School of Aeronautics, we had to do something.

Could you please correct this mistake and give us back our property?

CLIFFORD E. SADLER
President, Sadler Aircraft Service
Danbury, Conn.

• FLYING *too received numerous letters about this illegal transfer of property, which is transferred, herewith, back to its proper owner. However, let it be known that we checked a source at Danbury by phone prior to publication just to be sure. Maybe the connection was poor.*—ED.

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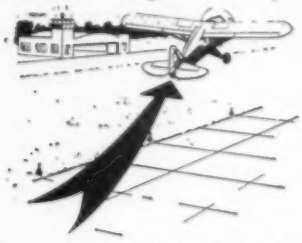
BUT YOU SURE CAN FEEL IT!

Some features of an airplane you can *see* from inspection, but the most important feature of all—performance—you seldom *see*. You've got to *feel* it . . . *feel* it in actual flight, *feel* it under critical conditions. Performance is the only proof of promise.

You see many fine, attractive aspects of the Piper Tri-Pacer, but the Tri-Pacer's #1 feature—**unmatched performance in flight**—can only be *felt*.



The *feeling* begins the moment you open the throttle of the husky, 160 horsepower Lycoming. The surge you *feel* as you're airborne tells you you're in fast, but pleasant, company. You *feel* the **superior climb** as you watch the altimeter wind up, and up.

The Tri-Pacer is famous the world over for its **stability,** but nobody's ever *seen* it. You have to *feel* it when, with wheel full back, trying to stall, nothing happens. The Tri-Pacer just sits there steady as a rock, mushing forward with full aileron control.

You can't *see* the **rough air superiority** of the Tri-Pacer. Come to think of it, you can't *feel* it, either—except by comparison with other airplanes in similar rough air conditions. Then you discover that the short-span, compact design of the Tri-Pacer gives you the smoothest ride.

Comfort and quiet? You can't *see* them, but you know they're there at the end of a thousand-mile trip. Then you know the Tri-Pacer was designed for relaxing cross-country travel.

You don't *see* the Tri-Pacer's **speed,** until you fly alongside other aircraft in the same class. Then you really *can see* that the Tri-Pacer is faster . . . measurably faster.

You can't *see* the astonishing **ease of flying and landing** a Tri-Pacer, but you *feel* it first time you circle the field. Simplified, interconnected controls take the work out of flying; flaps give you a nice, comfortable approach; Hydrasorb tricycle gear makes landing almost automatic.

Under least favorable conditions you can't *see* the Tri-Pacer's **extra performance.** You *feel* it, though, on a hot, lift-less summer day . . . on a short or rough runway . . . taking off from a high altitude strip. Here the Tri-Pacer's extra "zip" really pays off in performance.

You can't *see* the **reliability and stamina of the Lycoming engine.** But you *feel* it in the confidence you know you can place in this best of all light plane engines.

When you're in the market for **safe, economical transportation,** don't just look and listen. Check the features that determine an airplane's true character—fly it, and *feel* for yourself. Then you'll discover that the Tri-Pacer is the airplane for you.

For a demonstration flight see your Piper dealer, or write for Tri-Pacer brochure, Dept. 8-G, Piper Aircraft Corporation, Lock Haven, Pennsylvania.

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Briefings . . .

ELIMINATION of the "black hole" on the ILS runway at Washington National Airport is being put to the test by a new Sylvania fluorescent lighting system illustrated here. Lower picture shows flood-lighting with beacon-type VHO (very high output) fluorescent lamps installed in 30-inch-high reflector fixtures

flanking both sides of the runway. The continuous, 1400-foot lines of light are broken only by an intersecting taxiway. Top picture shows same runway before fluorescent lighting. The new system was developed jointly by Sylvania Electric and CAA.

THE COMANCHE "250," with a direct-drive 250-hp Lycoming Engine is coming off the Piper production line at Lock Haven, Pa., in three models—Standard, Custom and Super Custom. Prices FAF factory are $17,900, $19,650 and $21,250, respectively. This higher-powered version of the all-metal Comanche "180" introduced earlier this year, according to company officials, required only minor structural changes to accommodate the 250-hp Lycoming.

COMPLETE 100-HOUR inspections on DC-3's are being done at Remmert-Werner shops in about a third of the usual time through the use of their own developed "Wrap Around" shop and new inspection system. In terms of savings to the DC-3 owner, maintenance costs are brought down to a flat price of $289, plus parts and extras. The new system and equipment is now at all Remmert-Werner facilities—St. Louis, Toledo, Pompano Beach, Fla., and McBride, Mo.

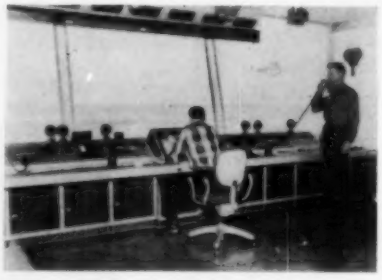
SOME WEEKS AGO a group of aviation mechanics met in Fremont, Nebr., to establish a national code of ethics for A&E's primarily involved with the inspection, maintenance and repair of aircraft in the less than 12,000 lb. gross weight classification. Although local in conception, all A&E's, also airport operators, are invited to join in this new organization, perhaps the first of its kind in the country. DeForest L. Brown, Brown's Airport, Weeping Water, Nebr., is President; Vern Goodin of Gordon, vice president and Rolland Nelson, Fremont, secretary-treasurer.

AN EXPERIMENT considered to have major implications in executive and private aircraft operations is being carried out at Teterboro (N. J.) Airport. The Port of NY Authority has set aside a 200x400 ft. sod strip, near the control tower, to check the practicality of such a strip for "STOL-plane" (short-takeoff and landing) operations. A Helio Courier is involved in the experiment and if the operation is successful similar strips may be made available for STOL type aircraft at other busy airports.

UNDER NEW RULING, CAB may now delegate aircraft inspection authority to otherwise qualified mechanics who have held their rating for a total of three years. Heretofore the mechanic was required to have had three consecutive years of experience immediately prior to his application for inspection authority.

ALL FORNEY AIRCOUPES henceforth will bear DAY-GLO fluorescent markings unless otherwise specified by the purchaser. The Ft. Collins, Colo., manufacturer provides the markings at no extra cost and at the risk of detracting from the outward appearance of the Aircoupe's attractive, two-tone paint job but has elected to use the Blaze-Orange markings in the interest of safety.

FIRST OF THE NEW CAA Airport Tower Control Consoles, adopted as standard design for airports in 11 western states, is this console installed in the tower at Natrona County Airport near



Casper, Wyo. Produced by Elgin Metalformers Corp., Elgin, Ill., the new modular design concentrates all instruments and equipment within easy reach of the traffic controllers, in this case Robert V. Bruce and James McCoy both of Casper.

AT TIMES TOPPING 1,500 mph, Capt. Walter W. Irwin, 34, of Hamilton AFB, near San Francisco stoked his USAF Lockheed F-104A GE J79-powered Starfighter to a new world speed-record of 1404.19 mph on a straightaway course over Edwards AFB. A member of the 83rd Fighter-Interceptor Squadron at Hamilton AFB, Captain Irwin's record surpassed by nearly 200 mph an earlier record of 1207.6 mph set in 1957 by Maj. Adrian E. Drew in a USAF McDonnell F-101A Voodoo Fighter.

THE WEEK BEFORE (early May) Maj. Howard C. "Scrappy" Johnson, the 83rd Squadron's operations officer, captured the world's altitude record when he shot into the stratosphere in another Starfighter to 91,249 feet—more than two miles above a reported 80,190-foot record set by a French-built experimental Trident jet. The Trident, in turn, had bested the officially-recorded altitude mark of 76,928 ft. set on April 16 by Navy pilot, Lt. Cdr. George C. Watkins in a Grumman F11F-1F jet fighter.

OTHER WORLD RECORDS were set on May 22-23 by USMC Maj. Edward N. LeFaivre in the time-to-climb speed category. Flying a P&W - J57 - P8-powered Douglas F4D-1 at Point Mugu (Calif.) Naval Air Test Missile Center, Major LeFaivre captured from the French the 3,000, 6,000, 9,000 and 12,000 meter records and established a 15,000 meter (49,212.5 ft.) altitude for which there was no previous record. His time for the latter was 2 minutes 36.05 seconds.

FIVE PER CENT DISCOUNT on car rentals is being offered by Avis-Rent-a-Car System to airline patrons purchasing round trip tickets from airlines who use Avis services. The discount applies on both cash and credit rentals.

ON PICTURESQUE Martha's Vineyard Island off the coast of Massachusetts an intriguing experiment is taking place which, if successful, may lead to a nationwide development. A "Learn To Fly On Vacation" project is in action there

(Continued on page 90)

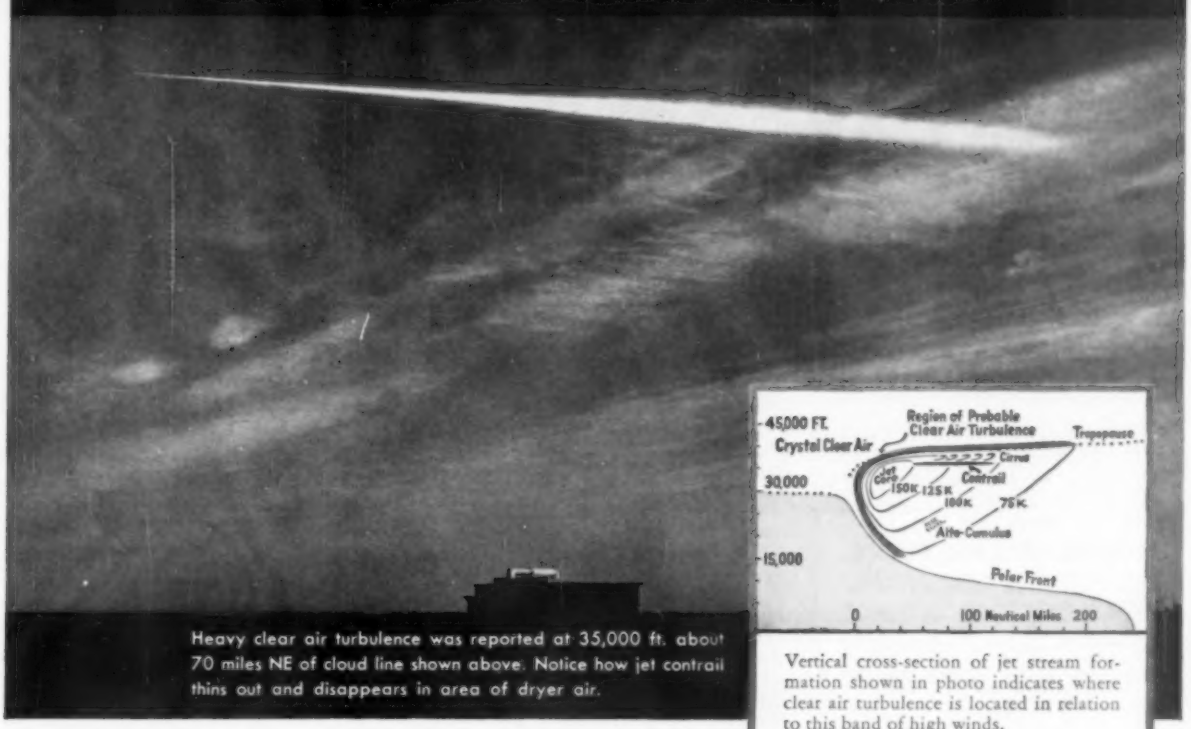
FLY WEATHER-WISE

Mobil

These weather items prepared in consultation with the United States Weather Bureau

CLEAR AIR TURBULENCE

HOW IT AFFECTS HIGH-ALTITUDE FLIGHT



Heavy clear air turbulence was reported at 35,000 ft. about 70 miles NE of cloud line shown above. Notice how jet contrail thins out and disappears in area of dryer air.

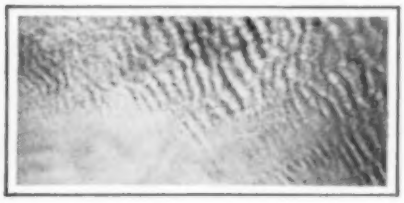
Vertical cross-section of jet stream formation shown in photo indicates where clear air turbulence is located in relation to this band of high winds.

FLIGHTS in the 20,000 to 40,000 ft. levels often encounter clear air turbulence. It is more of a cobblestone variety than the drafts associated with vertical currents in cumulus clouds. Though brief, this effect may be severe.

Clear air turbulence is caused by turbulent eddies in regions of marked windshear, that is, wherever wind velocities (speed and direction) vary sharply over short distances. It is generally associated with the tropopause and edges of the jet stream.

Conditions to watch for in flight: Haze and cirrus clouds at or near flight level. Rapid temperature changes. Fluctuations of airspeed indicator. All can indicate approaching turbulence.

What to do when turbulence is encountered: Reduce speed. This may reduce severity of jolting. Change altitude. Change direction till turbulence ceases, then resume heading.



Alto-cumulus billows associated with jet stream. Cobblestone turbulence is sometimes encountered above these clouds in clear air.

Photograph courtesy Munitalp Foundation, Fostering Pure Research in Meteorology.

How Mobil fuels meet requirements for high-altitude flight:

Mobiljet fuels flow freely, give maximum performance. Various grades permit operation over a range of temperature from −76°F to + 100°F. Volatility characteristics allow easy starting on ground and at altitude . . . prevent rapid evaporation, vapor formation as altitude increases.

For Top Flight Performance—Make it **Mobil** *You're Miles Ahead with Mobil!*

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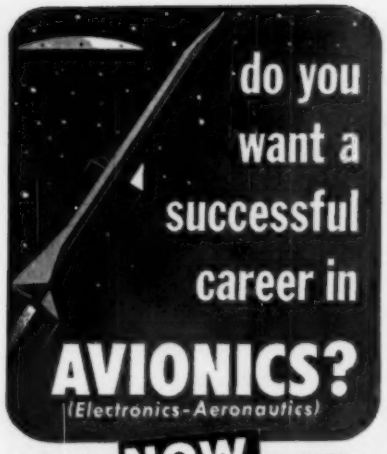

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HANGAR FLYING

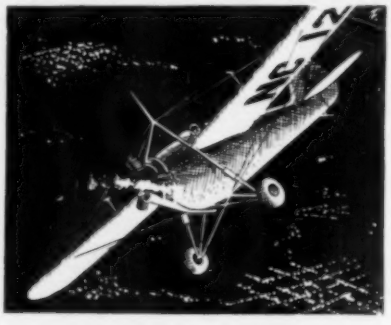
GOD'S WITLESS SPARROW

MANY EARLY PILOTS can look back upon some incident or experience that molded their attitude toward flying and set them straight on their eventual careers. It need not necessarily have been any hair raising event. I'll always recall such an incident in my own flying.

I had a little Buhl Bullpup with a three cylinder Szekely in the nose, and sans compass, radio or much else besides a road map, flew from Harrisburg over the hills to old Hoover Airport in Washington, D. C., 90 air miles away.

Late in the afternoon I started back to Harrisburg but missed my first check points. Immediately lost, I latched onto a road and eventually came to Frederick, Md. I landed in a field, got a motorist to take me to town, bought five gallons of gas, filled the tank again and was on my way. I would follow the mountain ridge to Emmitsburg, the road from thence to Gettysburg and breeze on home by following the Harrisburg Pike. The sun has set but car lights would show me the way.

It didn't work out. A wind sprung up and drifted me away from the mountain ridge. I missed Emmitsburg and wandered around until a big electric sign



appeared. It was on top of the Yorktown Hotel in York, Pa. Now I knew where I was and in a few minutes came over Harrisburg.

Here the airport lights were out. TWA's last Tri-motor Ford had left on schedule. I circled a few times and decided to try for the Army Air Force Depot at Middletown. Before I could make any more blunders the lights came on. The TWA field manager on his way home had heard me and came back to help me get down. I landed in good order, taxied up to the line and parked the Buhl Bullpup.

Next morning the Manager asked me to move the plane. I couldn't get the engine started. The tank was dry. I had landed on fumes.

That did it! I sat down right there and told myself that of all God's witless sparrows, I was last on the clothesline. That the Bullpup didn't have a compass or radio or navigation lights wasn't important beside the fact that it didn't have a pilot.

From that time on, I set out to be its pilot and years of happy landings with many airplanes have rolled by.

ALBERT H. STACKPOLE

Dauphin, Pa.

BAPTISM BY OIL

I WAS A STUDENT AT the University of Illinois in the spring of 1954. The previous semester I had earned my private pilot's license and was now enrolled in the aerobatics course. Because of bad weather, I had been able to get in only one hour solo time since I had checked out in the Stearman two weeks before. Today I was going up to practice areobatics for two hours.

With my helmet and goggles on, and a parachute bouncing jauntily against my legs, I thought that I cut quite a figure as I went through the usual preflight check.

I started by checking the oil which I found was about an inch-and-a-half below the "full" mark on the dipstick. Because I was unfamiliar with the plane, I asked a lineman if it needed more oil.

"How long are you going to be up?" he asked.

"About two hours," I said.

"Unless you drink half of it, you've got more than enough," he assured me.

I climbed in, fastened the seat belt and shoulder harness, and called to the lineman to wind it up for me.

Just off the runway I performed my run-up with the customary enthusiasm of a student pilot, made a clearing turn to the left, waited for a Tri-Pacer to shoot a touch-and-go, and was off the ground before the Tri-Pacer reached 200 feet.

It was a beautiful day—a little bit turbulent, but the wind was steady at about ten mph.

At 400 feet I leveled off, made a shallow 90-degree to the left, and left the pattern with a climbing turn to the right.

Leveling off at 6,000 feet (it was really 6,060 but that was pretty close for me), I started making my clearing turns. The ball was centered all the way through the turn, and when I straightened it out, right on the money, my confidence went up ten points.

I just got into a 180-degree to the left when it happened! Then suddenly the oil dipstick fell out.

The oil started pouring out as if it

(Continued on page 18)

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PURCHASE

Which one fits your business?

It's no news to you that today's markets are the hardest in ten years. Yet despite cautious corporate spending . . more Bells are being chartered, leased or purchased in 1958 than at any time in history. Why?

Corporations have had to trim both executive and sales forces. Remaining men must now handle more jobs, cover more territories, service more customers. Ground travel is too slow, and ordinary air travel is still dependent on airports and schedules, subject to quirks of weather. The versatile Bell, with its door-to-door flight plan, jumps off anywhere, anytime . . lands at will, refuels at a highway gas pump.

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Like to find out for yourself? The way is open . . through CHARTER, LEASE OR PURCHASE.* Simply write us today, Bell Helicopter Corporation, Dept. 15H, Fort Worth, Texas. We'll send you the full story, promptly.

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Another in a series on aircraft operation and maintenance... and why major service organizations, like the world's airlines, use **CHAMPION SPARK PLUGS.**

Noted aviation authority reports on **LOCKHEED AIRCRAFT SERVICE...**

the LAS word

by HERB FISHER

International aviation authority, veteran test pilot, author

Lockheed Aircraft Service is the largest and oldest company in the world devoted to the maintenance, overhaul and modification of all aircraft types. Its facilities are said to be the most complete in the industry.

Since its founding in 1938 as the service division of Lockheed Aircraft Co., LAS has processed more than 55,000 aircraft — helicopters to 4-engine airliners, single-engine jets to 10-engine bombers.

Eleven years ago, Lockheed's service division was incorporated as a separate but wholly owned subsidiary company—LAS—to provide even better service for Lockheed planes as well as independent service for all types of other aircraft. Today, LAS itself has two subsidiaries—LAS-International and LAS-Overseas.

The accumulated technical experience of LAS is vested in four ultra-modern overhaul bases: at New York International; Oakland and Ontario, Calif., International Airports; and Honolulu Airport.

LAS has pioneered complete engineering and manufacturing functions in several significant post-war developments:

First Constellation and DC-6 conversion to high-density interiors . . . The first U.S. military cycle-reconditioning program . . . First airline fleet maintenance and overhaul on a fixed-price-per-flight-hour formula . . . First helicopter conversion to scheduled passenger service . . . First major military jet maintenance program . . . First major airframe conversion of radar picket aircraft . . . Maintenance and overhaul support of airline and military fleets on the Berlin and Pacific Airlifts . . . First B-26 conversion to executive aircraft.

Military and commercial aircraft serviced by LAS are flying in every corner of the world—over all oceans, deserts, jungles, the Antarctic. LAS-O follows up with world-wide technical assistance. LAS emergency teams repair damaged aircraft at accident sites anywhere.

Herb Fisher

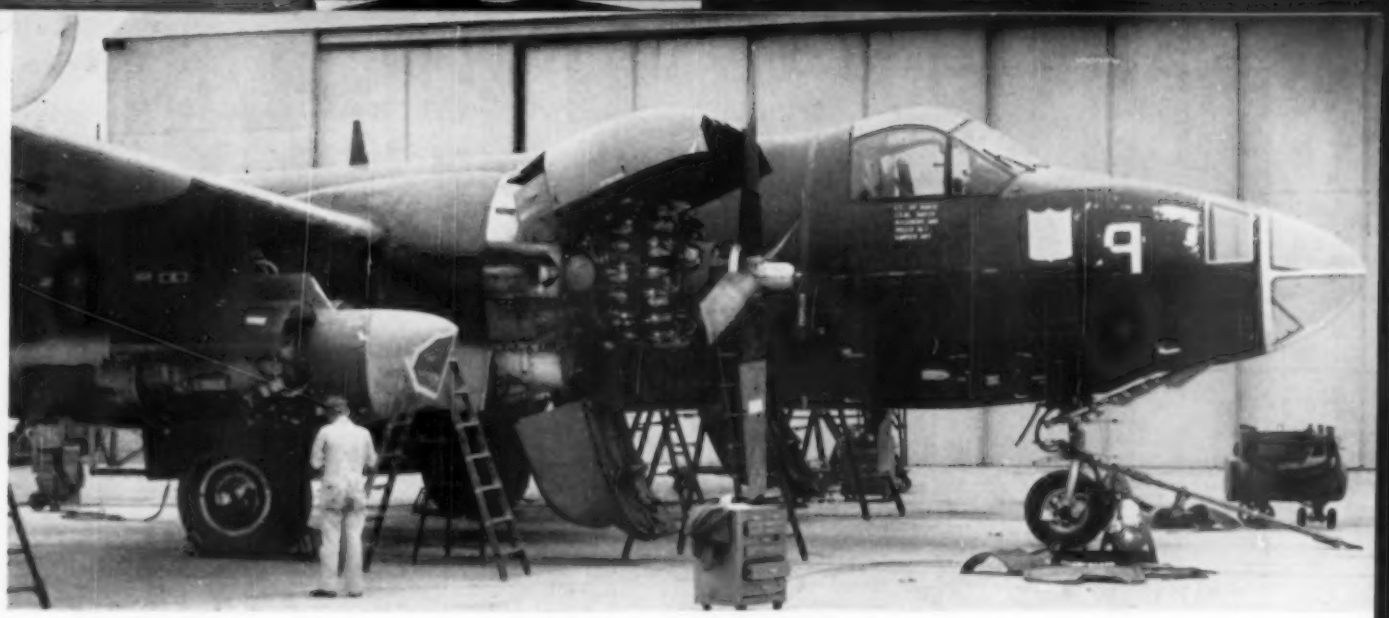
LAS' customer roster since the war has embraced almost every major international air carrier flying into the United States, as well as major U.S. domestic carriers and the Air Force and Navy, including the entire East Coast fleets of Airborne Early Warning aircraft. Overseas, LAS-O has assisted Japan in major aircraft and jet-engine overhaul programs, plus manufacture of T-33 trainers. A current technical assistance and materiel program involves Japan's 22-million-dollar manufacturing of anti-sub patrol aircraft.

In World War II, LAS operated seven major overhaul and modification installations, repairing 22,500 battle-damaged craft alone plus modifying and servicing thousands of others.

In the Korean War, LAS modified and rebuilt hundreds of planes.

This extensive variation in aircraft type and operational pattern by LAS

New 400-hour maintenance cycle for WV-2 Early Warning picket aircraft is performed at LAS-Honolulu, which has 27 shops.



Navy P2V-7 is modified at LAS-Ontario for 100-below "Operation Deep Freeze" in Antarctica.

customers is testimony to the company's experience level and the ready adaptation of its personnel and facilities to individual maintenance requirements. In this, the Champion Spark Plug plays a vital dual role:

First, LAS services a great many of the major airlines of the world. *In their exhaustive flight evaluations of every available spark plug, the airlines have repeatedly proved that Champions are best for reliability, service, economy. All the major airlines of the world fly with Champions.*

Fisher (l) interviews LAS President J. Kenneth Hull (r) and W. J. Weisbruch, Acting Plant Superintendent.

Second, as LAS President J. Kenneth Hull told me: "At LAS we must couple diversified know-how with only the finest first-line quality products in order to maintain our record of on-schedule deliveries of airworthy aircraft."

H. J. Chase, Vice President and LAS-I Base Manager, said: "Our customers depend on the finest quality plugs for peak engine performance throughout a *wide* heat range, whether operating in dry desert heat, jungle humidity or severe Arctic cold."

Foreign and domestic commercial planes plus U.S. military aircraft are serviced at LAS-I, New York International, largest East Coast independent maintenance facility.

Paul Kovac, Senior LAS-I Powerplant Engineer, said: "Plugs may be affected by anything that goes wrong with an engine. If a plug is out of heat range, if it has a tendency to preignite or foul, schedule delays will follow. *Champions have proven their excellent quality control on our test- and flight-lines.* They're mechanically strong and do not experience core nose ceramic failures. We've found Champion a quality standard in an industry that *knows* high standards."

LAS' unique service program — Equalized Maintenance, Aircraft Rotation, planned spare-parts inventory and fixed-price-per-flight-hour formula — assures commercial and military operators maximum flight utilization through minimum ground time. The LAS Equalized Maintenance plan was applied to Early Warning aircraft, a marked departure from traditional military maintenance programs, to provide the USAF with higher utilization and operational flexibility.

Among Lockheed's earliest service jobs were modifications for such aviation greats as Amelia Earhart, Lindbergh, Sir Hubert Wilkins. Recently, LAS "royalized" a plane for His Majesty Haile Selassie, Emperor of Ethiopia, by installation of luxurious movable compartments — one of the most unusual conversion jobs in air transport history.

CHAMPION SPARK PLUG CO.
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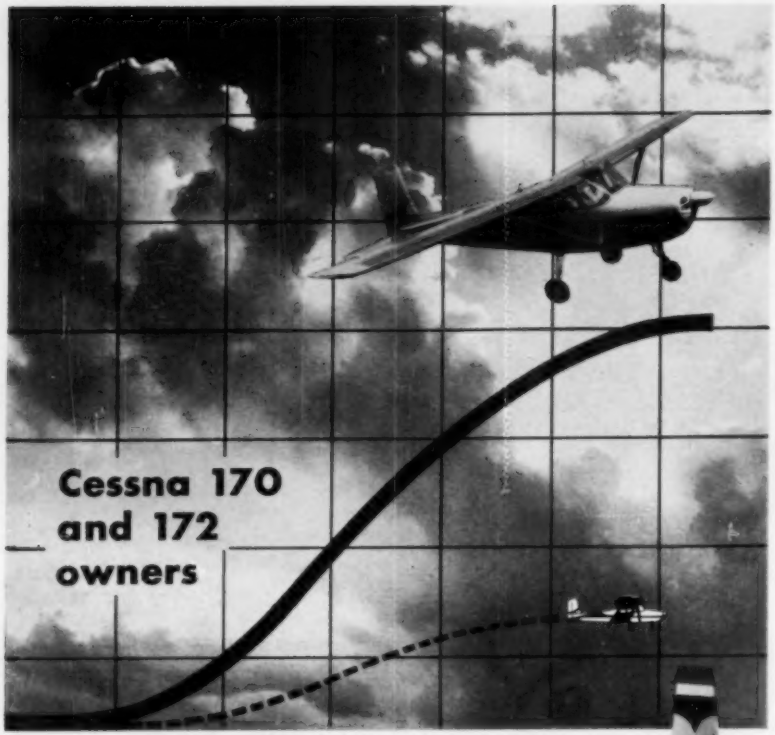
J. L. "Pete" Peters (l), Flight Line Dept. Head, recommends Champions for cars and planes. His Champion-fired Thunderbird won 35 trophies. Pilot is Capt. Edward Schank, LAS-USAF Acceptance Officer.



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Performance counts . . . some propellers claim a big boost in speed. Yet of all the propellers tested, none gave any outstandingly better cruising. McCauley proved best for all around flying excellence. So why sacrifice faster take offs for negligible, or no increase in speed. **Fly the finest . . . fly McCauley . . .** once again chosen as standard equipment for the Cessna 172.

Longer life is a built-in feature of every McCauley Met-L-Prop. Larger blades, quality materials and unique design mean greater repairability . . . give you better service. All of this is a real savings in overall propeller costs.

Want more cruise? . . . Write for details of our "switch your pitch" plan.

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"World's largest manufacturer of metal propellers for personal and business aircraft."

Hangar Flying

(Continued from page 14)

were being pumped through a fire hose. Before I had the plane straightened out, the whole left side, the windshield, and I were covered with oil. I could barely make out the instrument panel through my oil-splattered goggles. I started to panic.

What if it catches fire? What if the engine freezes up?

Finally I calmed down, and it dawned on me what had happened. When I went over to ask the lineman if I had enough oil, I hadn't secured the dipstick, and when I went back to finish the preflight check, I had forgotten all about it.

With my limited knowledge of the mechanics of the airplane, I didn't know how great or small the chances of fire were, but the idea of using the parachute scared me more than the idea of a fire, so I decided to bring it in.

I pulled on the carb heat, cut the throttle, and set up a slow glide toward the airport. I wiped off my goggles with one end of my scarf, and used the other end to clean the windshield.

There were a lot of open fields below me, but I was afraid that I might pick a rough one and tip my potential fire trap over. Since I still had more than 5,500 feet and the airport was in sight, I thought that it was the safest bet.

The oil temperature didn't go up any while I was losing altitude, and a little bit of the tenseness left me.

At 800 feet I was about a mile-and-a-half out and headed right for my base leg. I started slow flying and when I was a half-mile out, the engine started heating up, again I broke out in a cold sweat.

There were a couple of Aeroncas and a Cessna 140 in the pattern. I wiggled my wings to attract attention, cut out one of the Aeroncas, chopped the throttle, and made a 90-degree to the left onto final approach.

Now that I had safely reached the airport, I began worrying about landing. I had almost ground-looped once before and knew two other students who did. I couldn't see through the oily windshield, which added to my nervousness. I made a pretty good three-point landing on the grass next to the runway, and turned off at the first taxi strip.

By the time I reached the ramp quite a crowd had gathered to look at the oil-splattered plane and pilot. I was still shaking when I climbed out of the plane and felt small enough to crawl into the pitot tube. To my surprise, I did not get the expected ribbing.

A mechanic made a quick check and said that he thought there was enough oil left to have kept the engine from overheating, and that no damage was done. He said he could find a new dipstick.

When I told my instructor why it had fallen out, he wasn't interested in how easy the dipstick could be replaced; he was just angry and concerned over my carelessness.

ROBERT BORNARTH

Urbana, Ill.

Flying Cattleman Likes SAC Cessna Service

W. R. (Bob) GODDARD ENDORSES FLAT RATE SYSTEM FOR "310"

W. R. (Bob) Goddard knows the best in ranches, oil wells, and airplane service, having invested successfully in each. He pilots a Cessna 310 to cover interests throughout the southwest, a favorite destination being his great cattle spread in the "Hereford Heaven" section of south central Oklahoma.

Booted Bob is pictured in discussion with Earl Webb, Southwest Airmotive service sales manager. The topic is SAC's new Flat Rate Catalog, a page of which lists overhaul prices for the Cessna 310 — airframe, engine, accessories, propellers, and instruments. Bob Goddard not only knows the best in Cessna service, he consistently gets the best at Southwest Airmotive and endorses SAC's flat rate way of doing things

By the way, that table in the middle of the ramp isn't so far-fetched. It symbolizes the fact that wherever you are, and whatever the size or type of your airplane — large or small — Southwest Airmotive will make it convenient and economical for you to enjoy the finest One Stop Service in all America.

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The WEATHERMAN Slim Six measures only 1-1/2 inches thick and 3-1/2 inches high and fits easily in your jacket pocket. Built for rough treatment!

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HAVE YOU READ?

By JAMES F. SUNDERMAN

LOW LEVEL MISSION: The Story of the Ploesti Raids, by Leon Wolff (Doubleday, $4.50).

The great air strike of August 1943, on Ploesti, was both a tragedy and a success —tragedy, in the loss of trained flight crews—440 dead, 279 taken prisoner—plus more than 62 bombers shot down while inflicting negligible long-term damage to the oil facilities —success, in the psychological impact on both the Allies and the Germans, and the vital lessons (strategic and tactical) learned about aerial bombardment—a decisive factor later in the war. The heroism of the airmen at Ploesti is marked by five Congressional Medal of Honor winners—the highest number for any single military event in American history.

Ploesti will remain a controversy so long as men study war. The author captures this in piecing together a commendable story from official documents and personal interviews with Ploesti vets. A last chapter, tracing the ultimate demise of Ploesti under 15th AF attack a year later is interesting but anti-climactic.

U. S. CIVIL AND MILITARY AIRCRAFT FOR 1958, compiled and edited by the publisher (Robert Longo, paperback—$2.95; hardcover $5.95).

Now available in both editions, this handy reference book for dealers, prospective customers, owners and operators, manufacturers and researchers, collects performance specs, and general interest items such as price, serial numbering, etc., on all American airplanes in current manufacture, civil and military, illustrated with nearly 200 clear photos.

A DAY IN THE LIFE OF A SUPERSONIC PROJECT OFFICER, by Lloyd Mallan (David McKay, $3.95).

Delivery of a modern combat-ready supersonic fighter into the AF arsenal climaxes years of engineering and flight test. The USAF's Air proving Ground Center (APGC), Eglin AFB, Fla., is the last step in this chain. Here the aircraft is flown and married to its armament after strenuous airworthiness testing at Edwards AFB, Calif.

Lloyd Mallan dramatically captures this slug of development-test in a beautifully illustrated account of the combat-ready evaluation of the Convair F-102A-"Delta Dagger" now a vital part of our Air Defense system.

The story is told through the activities of Major Thomas "Pappy" Goetz, Project Chief of Operation Sun Dial—code name for the 102-A project. The book spins a highly personalized human interest yarn and neatly portrays the vast and complex APGC test-evaluation system through which all accepted USAF aircraft pass.

FIRST FLIGHT, by Oliver Stewart (Pitman, $5.50).

This British original now in American edition, dips principally into European aviation history to trace the technical and operational progress of flight through "notable firsts" which marked breakthroughs, important practical applications, and extension of the use of airplanes. It covers from Sir George Cayley, Ader and Santos-Dumont, and the Wright brothers to Maj. Chuck Yeager and Mach 1.

ROCKET, by Air Chief Marshal Sir Philip Joubert de la Ferte (Philosophical Library, $6).

Unlike more recent rocket and missile books, this one is authored by a military man, and views the business from a military angle. Over half the volume is a history of the German development and use of rockets in WWII; and of British countermeasures. An interesting story of Peenemunde from Allied intelligence and operational documents.

1957-1958 AIRCRAFT YEAR BOOK (American Aviation Publications, $6).

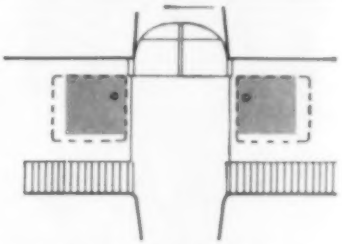
The 39th Annual edition of the official Aircraft Industries Association U. S. aviation reference book, is a "must" for every editorial shop, aviation library and home collection. It is an 8x11½ inch hardback marking a significant improvement over past editions and cataloguing a thorough picture and narrative coverage of military and civilian aviation in 1957.

SATELLITES AND SPACEFLIGHT, by Eric Burgess (Macmillan, $3.95).

A scientific treatise on rocketry and space by the well-known British writer develops the earth satellite picture from construction, instrumentation, launching, telemetry and flight orbit. It projects manned spaceflights to the moon and planets with realistic accuracy and authority.

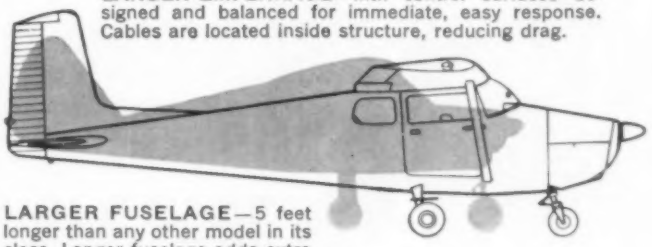
NEW FULL-SIZE, ALL-METAL CESSNA 172 FOR '58

IMPORTANT: The modern design of the larger, roomier, more stable Cessna 172 offers you speeds comparable with other airplanes in the low-price field.



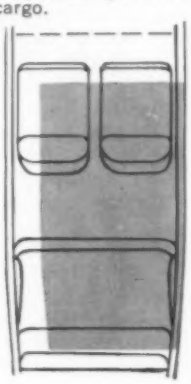
MORE FUEL CAPACITY— 42 gallons. Fuel can be easily drawn from one or both wing tanks. Selector valve located between front seats for easy access to either seat.

LARGER EMPENNAGE—with control surfaces designed and balanced for immediate, easy response. Cables are located inside structure, reducing drag.

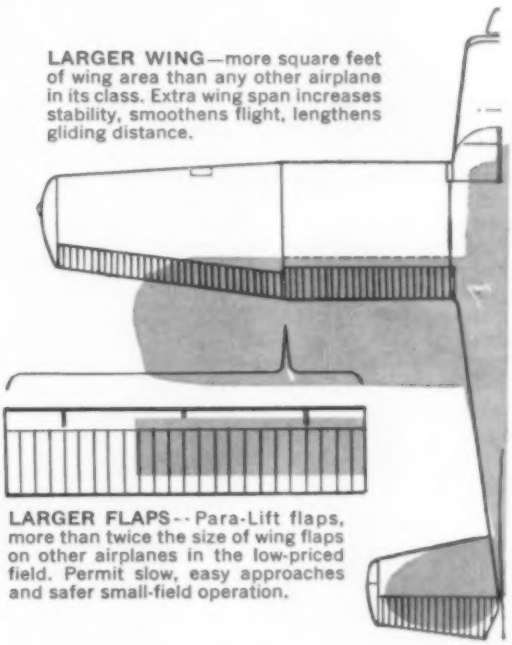


LARGER FUSELAGE—5 feet longer than any other model in its class. Longer fuselage adds extra stability, extra roominess for passenger comfort on long flights.

LARGER CABIN—with new interior design, new comfort features, new fabric, new color for 1958. All-metal 172 has two yard-wide cabin doors for easy loading of passengers and cargo.



LARGER WING—more square feet of wing area than any other airplane in its class. Extra wing span increases stability, smoothens flight, lengthens gliding distance.



EASIER TURNING—Cessna's famous patented Land-O-Matic landing gear is engineered for ground stability, taxiing, easier landings and take-offs. Includes fully steerable nose wheel and individual toe brakes.

LARGER FLAPS--Para-Lift flaps, more than twice the size of wing flaps on other airplanes in the low-priced field. Permit slow, easy approaches and safer small-field operation.

MOST SPACE AND STABILITY IN ITS CLASS

For full-size performance, full-size comfort—here's the only full-size airplane in the low-price class: 1958's new, *all-metal* Cessna 172! Most *relaxing* proof of its larger size is a roomy interior newly designed for 1958. New executive-type styling, new luxurious fabrics, form-fitting adjustable seats (both front and rear), plus many other features, make the cabin of the Cessna 172 the most comfortable as well as the most spacious in its class.

The new 172 offers the most stability in its class, too. Plus patented Land-O-Matic—a wide-span, spring steel landing gear that reaches out as if it owned the runway—for easy "drive-in" landings, "drive-up" take-offs. Price: $8,995 with std. equip., f.a.f. Wichita. See your Cessna dealer (Yellow Pages of phone book), or write CESSNA AIRCRAFT COMPANY, Dept. F-27, Wichita, Kansas. Inquire about Cessna Lease Plans.

The only full-size airplane in the low-price class

6 GREAT CESSNAS 172 175 180 182 SKYLANE 310 THE COMPLETE AIR FLEET FOR EVERY BUSINESS NEED

Tragedy at the Source

GILL ROBB WILSON
Editor and Publisher

THE FULL measure of tragedy in the late series of mid-air collisions is not to be found in the collisions themselves but in the national astigmatism that failed to anticipate them. Our government has become so unwieldy, so politely pre-occupied, so bureaucratically enmeshed, so socialistic in operation, as to become incapable of foresight, firm decision or timely action.

The mid-air collisions were no surprise to any knowledgeable airman. They were preceded by thousands of hairbreadth escapes over a decade. The airman has long pointed out that visual cockpit surveillance is no longer adequate to cope with increased speeds and volume of traffic. He has testified time and time again that tragedy was inevitable. And now we have had it, a stark, cynical blot, not on the escutcheon of aviation but on a government too paralyzed to provide conceptual lead time for the advancing forces of our era.

Some of us think this is a greater tragedy than any conceivable accidents in the air or on the land and sea. We have a fierce pride in the character of our government. We hold it to have responsibility under God. Millions of us have offered to die for it and felt the price was right if it continued to serve the ends conceived for it by our forefathers. We can not in conscience look on silently while in its greatest hour of opportunity in history it is content to survive rather than determined to lead.

The naked truth is that the government and people of the United States are mortgaged to the hilt by worship of a materialistic standard of life—a vain boast against the dynamics of a civilization that is aspiring to the stars.

Look without flinching at the record. At no time in aviation history, for example, have we had technological superiority. Always our sheer weight rather than our foresight has been our reliance. Not we but Germany and Britain developed the new forms of power for the air age—the jet engine, the rocket, the ramjet, the turbojet, the by-pass—and in air surveillance, radar. And, if it were not for expatriate German scientists, we might not be in the same skies with the Sputniks.

Or examine the record of use which our political leadership has made of the decisive power for world freedom and peace placed at their disposal by the American airman. We had the industrial air potential and concept of airpower to thwart Hitler's ambitions to conquest. The airman urged its utility but was brushed aside. World War II, a conflict in which, regardless of who won, the free world could not win, could have been prevented.

Astigmatism to the potential of airpower turned over Asia as well as the Balkans to the Communists. Dismemberment of airpower at the conclusion of the war frustrated any chance of an equitable peace. Poverty of air research in the subsequent years permitted the Soviet to bid for domination of the Pacific via Korea. Nor have we ever recovered from those lost years of research. The record of our great tragedy belongs exclusively to no political party or administration. We, the people, have authored it in our contentment with the trend of government. It is not without logic that we perish as private citizens in penalty thereof.

Nor do I think we in aviation have been guiltless. Competition has been our idolatry rather than our inspiration. Our business policies have been wasteful beyond condonement. We have played poker in the political back rooms—and not very good poker. We have not had the intelligence to stick together and fight our battles in aggregate strength and dedication. As a consequence we have had lame duck administration at the Washington level. Our route structure of commerce is an economic shambles. Our air defense has paid incalculable penalty in economy and efficiency. Our business flying which ties the industrial complex together has been made to seem a luxury. And the private citizen screams in righteous rage as his place in the sun is victimized by universal confusion.

The problem now is—in view of the enmeshment of government and the visionless pattern of facilities laid down, will we continue to resort to expediency in temporary solution of a critical situation or at last realize that America's air destiny requires a long range high priority brand of statecraft?

Many of our most pretentious civil air terminals are memorials to yesterday's volume of traffic—economic monsters saturating the efficiency of commerce with their unwieldiness. To use them is the airman's headache; to avoid their entanglements both aloft and on the ground, his ambition. We reduce the vastness of the sky to a few pinpoints on the ground. We abort the sky's capacity by failing to segment its length and breadth and depth to traffic requirements.

I should judge the first step in meeting our whole problem might be an independent National Aviation Commission staffed by men of thinking stature and answerable to the Chief Executive. Power of decision is imperative. They should evolve a national aviation policy for executive and congressional approval. I judge their findings would be revolutionary and, unless they are capable of creative imagination, they would be useless.

Is government capable of action? Can lead time in concept be introduced into national policy? I do not know. I only know that unless it is, this nation will compound tragedy of omission and commission to its bitter end.

HOW AMERICAN'S FAMILY HALF-FARE PLAN MAKES GROUP TRAVEL EASY

Family Half-Fare rates are in effect on American Airlines from 12:01 noon Mondays to 12:01 noon Thursday.

During this period any person purchasing a full fare ticket can take along his or her spouse and their children for half fare.

American originated the Family Half-Fare Plan to make group travel easier for everyone. For instance, on a coast-to-coast trip for a family of four, the savings on Family Half-Fares may amount to hundreds of dollars.

American's easy credit terms also enable travelers to start a trip with only a small down payment and pay off the balance in convenient monthly installments.

AA AMERICAN AIRLINES

America's Leading Airline

Typical Kapauku Native man (bottom) and woman (top) of Wissel Lakes region, Dutch New Guinea.

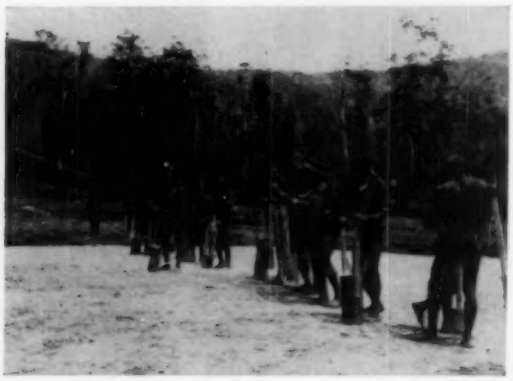
Out in the chartless Guinea hills
the pigment is in reverse;
black is the mark of the royal line
and clothing a useless curse;
and the drums give tone to their hopes and fears
as you lower your wing where the jungle clears
to meet the naked men with spears
who come to the native bourse.

You have no creed or code or law
to share with the Stone Age clan;
and all you know is that they, like you,
are made in the mold of man;
so you arm your face with a friendly smile
and you open your hand to deny your guile,
and the ages shrink for a little while
out there beyond beyond.

Excerpt from "The Airman's World"
By Gill Robb Wilson

PILOT

By E. W. ULRICH



Above: Native chiefs help stomp newly filled areas of Ilaga airstrip. Below: Completed Ilaga strip (elevation, 7,300 feet) graded and cleared, with center line defined with wet ashes.

Dear G. R. W.,
It seems as though I know you through your editorials, and "The Airman's World." I am sending this article to FLYING *because I think airmen back home would like to know about pioneer work here. I can't justify to those, unlike yourself, not familiar with flying conditions in New Guinea, just what we are up against. There are few places on earth where an hour's flight takes you back to the heart of the "stone age." If I can but draw some interest in this work, I will be happy.*

After four years in the Air Force as flying instructor on twin and four-engine aircraft, I went into business after the war. Not until 1950, when I was challenged by missionary flying, did I again take up piloting full time. I served as Chief Pilot of the Aviation Section of The Christian and Missionary Alliance until June 1957. At that time, the C. & M. A. turned over their flying program to the Missionary Aviation Fellowship, a group that specializes in serving missionaries the world over. Wishing to remain in New Guinea, I joined the associated airline of KLM, becoming their Senior Pilot and Check Pilot. Although I am not now flying directly for the missions, I still keep a hand in the move to open up the interior.

The work of building strips by the missionaries has led to government building of other interior strips. A few months ago—after having landed the first Cessna on a small strip in the Baliem, I landed a Beaver and more recently landed the large Scottish Twin Pioneer on the original strip in the Baliem. Today we have regular service by Twin Pioneer to the Baliem. Equipment is continually being flown to the interior and work is well under way on a DC-3 strip which I first laid out from the air by Cessna.

Yet we are 15 years behind in flying aids. Our airline

BEYOND BEYOND

service all over New Guinea by DC-3, Twin Pioneer, and land and sea Beavers, is difficult. We have only one powerful N.D.B. at Biak. At Hollandia and Merauke weak N.D.B.'s offer little help when the areas are filled with CB's. Of the 15 other coastal strips, some are still covered with P.S.P. from the last war; others, short grass strips have soft spots where the bomb holes were not properly filled. Yet, there is a challenge and I am happy to have had a part in this progress in New Guinea. It has been a rewarding eight years.

Keep your nose down—and regards,
E. W. Ulrich
% KLM Biak, Netherlands, New Guinea

WOULD THE natives attack? We did not know these tribes. No white man of recent times had contacted them. Back in 1929, Archbold's Expedition had entered sections of the Baliem Valley but that was almost beyond the normal life span of present inhabitants.

During the last war, the now famous Shangri-La Valley (Baliem) had been the scene of a C-47 crash and dramatic glider rescue. But that rescue had been from among natives 25 miles from our contact point. These few miles had the significance of hundreds of miles due to the peculiar division of territory among the tribes in the Valley. Each tribe has definite boundaries to its land, and is separated from other tribes by an area of "no man's land." Throughout these tribal divisions are high watch towers to give warning of attack from surrounding tribes.

We had some knowledge of native behavior from years of living and working with people in other parts of New

Above: A landing at new airstrip in Baliem valley interrupted a native war. Below: New Cessna 180 destroyed during Obano uprising at Wissel Lakes, Dutch New Guinea, November 1956.

Illustrated by Ed Valigursky

Natives digging away at the large mound of earth at the approach end of the airstrip use only the most rudimentary tools.

Guinea's Highlands. We knew that women in company of warriors indicated to other natives their peaceful intentions, enabling them to move about through dangerous territory. Because of this we had with us a young native couple from one of our highland stations and trusted that the natives (Ndanis) of the Baliem respected this custom.

We had worked toward this day. It was a typical "rainy season" morning with low clouds and moderate precipitation. Flight to the Baliem from our Hollandia base was over 300 miles of unexplored jungle usually hidden under layers of cloud and lines of thunderstorms. Where the lower jungles end, the mountains rise to 14,000 feet and completely surrounded our destination. Take-off was planned for 7:30 a.m. so we could reach the mountains early and slip through the narrow pass at 9,000 feet before cumulus buildups covered the ranges. However, due to local conditions, we delayed departure almost two hours. Weather reporting is still for the future down here; in fact, we were flying the only private aircraft in New Guinea.

One-eyed war chief of the Ndanis.

With the promise of improving weather at Hollandia, we departed for the first landing in the Baliem. Our twin engine Short Sealand amphibian easily topped the cloud layers at 11,500 feet. It was still raining up there from a higher overcast, but for the six aboard, it was a bright day to which some of us had looked forward for 15 years. It had often seemed that it never might come, especially while we were raising the $130,000 for the plane plus thousands more for spare parts. It had looked closer only when we took delivery of the plane in Belfast, Ireland, and started for New Guinea, half a world away.

Tension had begun to mount a few days before when we were preparing the supplies, tents and the generator for the radio transmitter. Yes, it was still raining, but we had a goal in sight. And yet it was not in sight. We had flown for an hour now. It was not safe to continue longer at 11,500 feet because we still could not see the mountains we knew were almost upon us. Would we have to turn back, or would the curtain lift so we could enter the pass? We tried a few circles—the weather changes rapidly in New Guinea! A faint line of crags—a few more circles, and we slipped across the ridge. Once over the Baliem Valley, it was a bright day. Weather had built up on the outer sides of the mountains leaving the 10 by 40 mile valley quite clear. Losing altitude, we excitedly began picking out tribal villages surrounded by patterned and irrigated gardens.

Our destination was a short stretch of the Baliem River at the southern end of the Valley. We had particularly chosen April since it was at the middle of the rainy season. The fast flowing river should be at its highest and remain so for at least three months. We circled lower and lower over the river. Everything had to be right. There would be no taking off again once the plane touched down. Besides, the people on board we carried over 500 pounds of equipment. Take-off from our sea level base at Hollandia (Sentani Strip) had gone well enough, but the Baliem River was over a mile high and offered few straight stretches. We noticed the river was in flood but also flowing very swiftly. During the last circle, natives shot arrows at us from a village. However, we decided to land. All joined in prayer. A final cockpit check—"turning onto final approach, a slight turn to the right to follow the river—below the tops of the trees—now below the brush on the banks—we're on the water" ran our radio message to the coastal base.

Landing against the current slowed us rapidly. We judged it to be eight to ten knots. The river was higher than we had estimated and, although we had planned to put our party out on the east bank, we were unable to approach near enough due to the overhang of the jungle. With propellers in reverse, we eased out into the center of the stream and drifted slowly backwards down current looking for other possibilities. When a likely place took our eye, we held the plane stationary against the current with the engines.

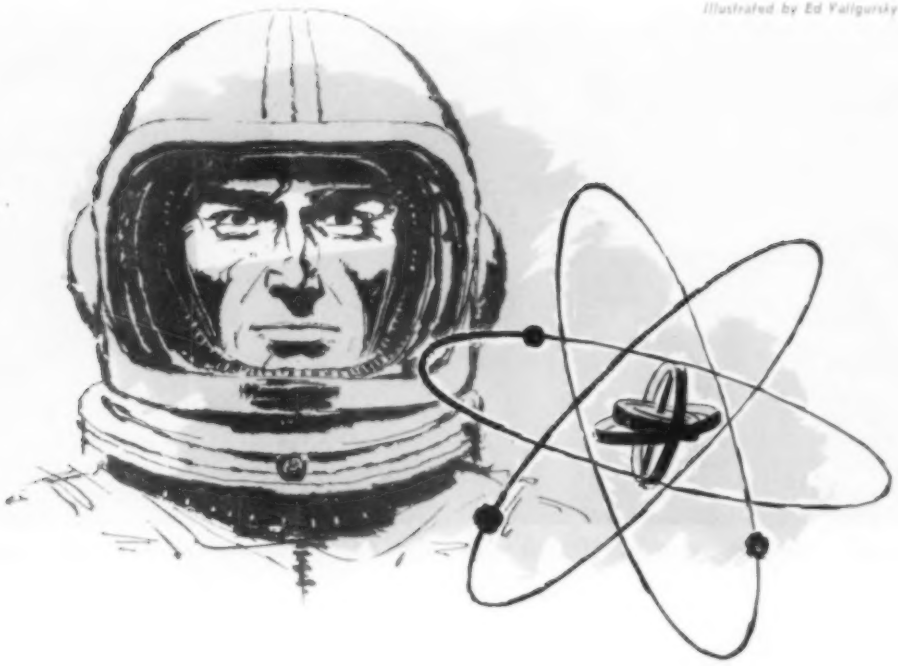
A section of bank on the west side of the river looked promising except for tall reeds extending some 25 feet out into the water. There was a terrific chatter from debris flying back over the hull as the propellers cut into the reeds. About ten feet from shore the engines were chopped. Over the nose I went with a rope—up to my neck in water desperately grasping at the reeds for support—a few more feet to the bank, then to a tree.

Had the natives seen us? Would it be over quickly, or would they wait? The party unloaded supplies, tents and radio and soon ready to cast us off. Shortly, we were taxiing up river for the take-off. The landing stretch was much too short for a get-away so we followed the river around a 30-degree turn and continued as far as possible to the rapids ahead. The plane was empty. We had used up extra gas en route and on the river so there should be no trouble with weight.

One propeller in reverse, one in forward pitch, and we pivoted and headed downstream. (*Continued on page 52*)

The first landing attempt at the Homejo Strip. The natives did not realize that this was not the normal landing procedure.

Illustrated by Ed Valigursky



One of the more complex problems facing the voyager in space is that of knowing exactly where he is at any given point or time.

GUIDANCE FOR SPACE

By MICHAEL CLARKE

IN THESE DAYS, WHEN a man with only a master's degree has trouble understanding the technical conversation of his colleagues, most experts believe that the science of electronics is still in its merest infancy.

This is particularly true in the field of astronautics. For very solid reasons the electronic guidance systems of flying vehicles, manned or unmanned, must become more sophisticated and reliable, while at the same time they must become smaller and lighter, and require much less power to operate. Otherwise they cannot be successful.

The bombing guidance system of the B-52 weighs in the neighborhood of one ton. It is not the ultimate in sophistication, but it is accurate, very reliable and comparatively easy to maintain; it was built to be so.

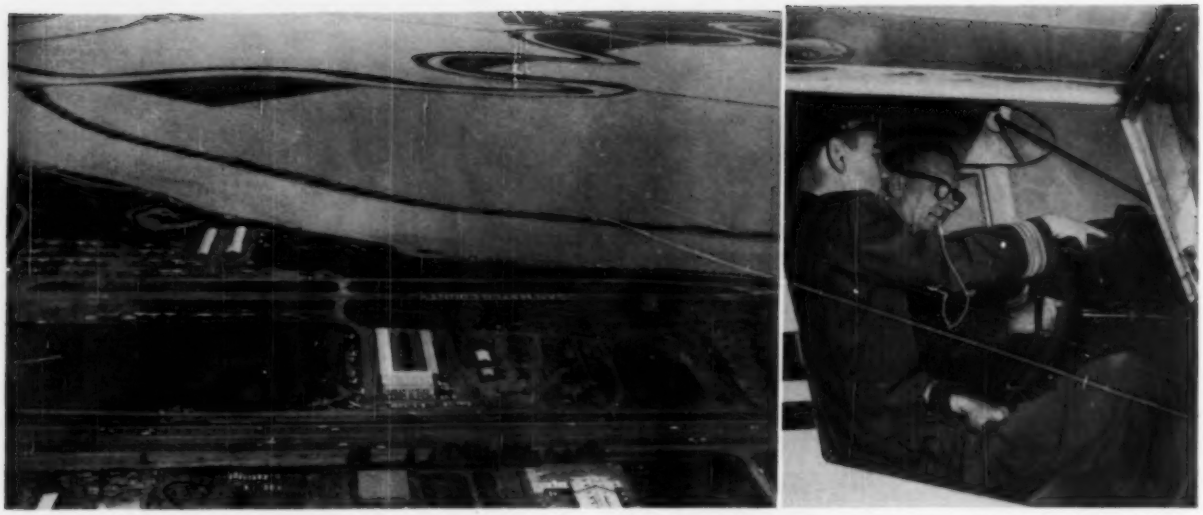
The comparable guidance system of the B-70, now in its construction phase at North American, will probably weigh more. The B-52 is a Mach one bomber; the B-70 is in the Mach three class, and thus its guidance system must do more and do it more quickly.

While the guidance systems of modern piloted aircraft are similar to those of ballistic missiles (both ICBM and IRBM) they operate in an entirely different environment. The aircraft guidance is continuous. Missile guidance operates for only a few minutes —until the missile goes into its ballistic trajectory.

The experimental Air Force X-15 probably will carry the first American in space flight. This will be a relatively simple operation, programmed in advance as to speeds, altitude and course, and guided from the ground. No complicated, self-contained guidance system will be necessary aboard the aircraft. But other and more esoteric programs visualized by Research and Development people of the Air Force for the next few years—satellites, lunar vehicles, the anti-ICBM missiles, the anti-satellite missiles and inter-planetary space vehicles, for instance—will require guidance systems as compact, light and sophisticated as human ingenuity can contrive.

A Mars probe, that is a vehicle sent from the earth to photograph the planet Mars and return, for example, might be three years on its mission. Any guidance and/or stabilization system which would operate perfectly during this three-year orbit is inconceivable at this time. It is not inconceivable, however, to create a guidance and control system which goes to sleep for long periods, awakens at pre-programmed intervals and then naps again for a few months to conserve its energy.

The transistor has, of course, become commonplace even in high school physics laboratories, as replacement for the electronic tube. In the interest of using less power and possessing more reliability, and of having immunity to high temperature and radiation, science is now taking the step beyond—with solid state devices such as high purity metals whose crystalline structure is arranged so that it acts as an electrical circuit element. The suboxides of certain refractory metals such (*Continued on page* 81)



Left: The San Carlos-San Mateo County Airport, home of Harper Aviation. Right: A Harper instructor briefs student on Tri-Pacer's instrument panel.

MOTHER LODE

"Hap" Harper

In little over two years, this California fixed base operator has evolved a formula for success by means of up-to-date merchandising techniques.

By C. C. BRADFORD

DURING THESE HARD-TO-CUT-IT days when fixed base operators are scratching for students, a mother lode of business is being mined by a San Carlos flight school. Up-to-date merchandising techniques and sound objectives have created this oasis in today's flying desert. There may be ideas and suggestions helpful to others. Its story seems worth telling.

San Carlos is on the sunny peninsula below San Francisco, 25 minutes by car. Here flourishes a tall, good-looking, businessman who answers to the name of "Hap" Harper. He is bringing aviation to more people in more backyards per capita than anywhere in the country—and in a manner pleasing to the minds of experienced airmen.

Harper started his flying career in 1934 in the Marine Corps; ran a post-war flying school while at Oberlin College, which project faded with the demise of the G.I. program; and then spent six years as a promotion man for Metro Goldwyn Mayer. From that background he took over the fixed base operation at San Carlos, convinced that, from a long range outlook, a good student program would provide the greatest potential for him.

Little more than two years ago, he opened up with two mechanics, one flight instructor, two light aircraft, and a battered station wagon. Immediately he arranged a visiting schedule of the elementary schools at San Mateo County. He offered a free ground school course to any pilots who would attend. His calling card always included a free ride over the city of San Francisco. He had a 20-minute film made for the luncheon circuit. He introduced credit—*learn to fly now—pay later.*

What started out as a peanut operation is now big time, with two Apaches, seven Tri-Pacers, a Cessna 182 and five full-time flight instructors who are in the air more than 8,000 hours a year. The ground operation includes two complete classrooms, a flight planning room, a link room, overhaul section, radio and instrument shops, a sales

Smartly uniformed pilots of Harper Air Charters, which is run like a miniature airline. Right: Link instruction is available to Harper students.

IN THE BAY AREA

department, and an air charter division. The instruction program is geared to training students who will be capable of operation from major airports. The aircraft panels have a "forward look" with full instruments and the necessary radio equipment. "Unless a student program goes full out toward making genuine pilots of its students, it will pancake of its own weight," says Harper. "That's why all my instructors are full-time teachers. I want professionals whose livelihood is wrapped up in teaching flying. If this job is done well, the 'ticket' is an easy maneuver to accomplish."

Hap and Chief Pilot Frank Celestre place a new student's thinking, at the start, well aft of the tail. As he learns—in ground training and with air instruction, his thinking moves forward until it is in the cockpit, abreast of the aircraft. By the time he is ready to take his first CAA test, he is thinking far ahead of the aircraft. In the *Private Pilot* course, the student puts in some 38 hours of air work which includes about 28 hours of dual supervision. Hap insists upon this seemingly excessive supervised time to assure concentrated practice and corrective training.

The limited solo time is merely to build up the student's confidence. In the *Primary Phase* the student gets eight 45-minute lessons. After he solos, he enters the *Secondary Phase* which involves one-and-a-half hour lessons. Each flight lands at a different airport in the Bay area, thereby necessitating the use of navigational radio and voice communications. There is also a dual night flying period. In the *Advanced Phase* the pilot gets a night cross-country solo and a link period. Link instructor Ron Lundy runs the budding pilot through the use of the full instrument panel with an approach problem.

For cross-country indoctrination, two students and an instructor cooperate. On the outbound flight one student does all the work, navigation and flying, but the second student navigates, too. They land, file plans, and fly home on a different route. The student pilots change seats and in this way both get the experience of a king-size cross-country.

During this *Private Pilot* course, each student attends 30 hours of ground school under the tutelage of Fred Weiholz, whose dog-eared flight log is practically a roster of American aircraft. The ground school operates seven days a week and covers aviation from the ground up to the jet stream.

And the result of the complete program?

Harper Aviation students average less than 40 hours of flight time for private licenses as against the national average of 54 hours!

Not called for, but available to any pilot is a Survival Course. It requires two days of brainwashing—one at San Carlos airport and another at the Coast Guard station at San Francisco Airport. In addition, Hap offers a free ground school course on week ends to any pilot who will attend. This is the school's contribution to Bay aviation and, according to Harper, will permit the once-in-a-blue-moon pilot to scrape the rust off his flying or keep the week-end sportsman pilot up to par. Hap feels that if all pilots operating from San Carlos keep their thinking out in front of the prop hub, the air above will be safer for everyone.

Harper Air Charters, cruising throughout the West, already logs a healthy 2,000 hours a year. The Charter division is like a miniature airline. There is a ticket counter at San Francisco Airport. The uniformed pilots sport four stripes in recognition of the airline standards established in pilot proficiency, aircraft care and maintenance. Hap says that, although the transcontinental passenger steps down in size of aircraft, this doesn't mean that he is sacrificing anything in safety or performance on a Harper Charter plane. (*Continued on page* 72)

Photographer Unknown

THE AIRMAN'S WORLD

We airmen call it a propeller but it's the same
old wagon wheel that has eased the friction of mankind's
toil since the times of antiquity.
Its original propulsive power was the human slave
and it turned slowly and only in the valleys.
Then its artisans smoothed out the rough
trails and the wheel began to creak up the mountains.

As the wheel lifted the burden of men into
the highland, so too it lifted their imagination.
They fashioned it to use the brute strength of the
animal kingdom. They reached out to embrace the earth
with their tools and weapons. It was their first
step in mastery of their environment.
Those who most adroitly powered the wheel to turn
faster and faster had the best of their world.
They turned it over the land and they turned it in
the sea and at last they turned it in the air
over the land and sea, and the airman has forever
conquered the physical isolation that agelessly has
tyrannized the spiritual potential of the human family.

It is a far cry from the agony of the sweating slave
to the throb of the singing engine and I hope
it is an even farther cry from the hand
that held the slave lash to my hand
on the throttles. What irony if I who am master
of the disk whirling in the sun see it as less than
the symbol of the full cycle of man's humanity
to man—unrealized but ever beckoning.

GILL ROBB WILSON

FLASHLIGHT LAWRENCE *The first*

IT SEEMS INCREDIBLE, but a man actually took a mural-sized aerial photograph of devastated San Francisco, just after the earthquake of 1906, from an altitude of 1,500 feet, using a camera weighing almost three-quarters of a ton.

The story begins in the year 1,900, with a meeting between George Lawrence, a photographer in Chicago, and a representative of the Chicago & Alton Railroad, who wanted a picture of the road's newest train for advertising purposes. He wanted a big one—a photograph at least eight feet long.

"I'll have to take several small pictures and piece them together," Lawrence said.

The railroad man shook his head. "No, Mr. Lawrence. We want a single photograph that size. All one piece."

"Are you crazy?" Lawrence asked. "There isn't a camera in all Christendom that would take such a picture!"

"I know that," the other answered. "That's why we came to you. We figured you could build such a camera."

Lawrence stood up. "Look," he said impatiently, "I know this is 1,900 A.D. and the beginning of a new century, a new era—but it's young yet. Give it time, man, give it time!" He grinned and shook his head. "Eight feet long! Haw!"

There were more arguments by the railroad man, more counter-arguments by Lawrence. In the end, however, Lawrence agreed to build the camera and make the photograph.

He began at once on the design. To hold a negative eight feet long, he planned a plate-holder six by ten feet. The bellows would have to extend 20 feet, and in order to move them back and forth, he provided wheels which ran on a pair of steel tracks. A flap in the bellows could be opened to let a man brush off the negative with a camel's hair brush before the picture was taken—to make sure it was clean.

With his design completed, Lawrence went to a camera-maker, J. A. Anderson, with whom he worked to build the one-eyed giant. Together they ground the lenses—a wide-angle lens with five feet six inches equivalent focus, and a telescopic lens with 11 feet equivalent focus—the largest ever made for photographic work up to that

aerial photographer used balloons, kites and ingenuity.

By HARRY EDWARD NEAL

time. A huge sheet of frosted celluloid served as a ground glass or focusing screen.

Plates and photographic paper were a problem, would have to be made on order. Lawrence persuaded the Cramer Company of St. Louis, Mo., to make the plates for $150 each and to furnish the paper.

When the camera was finished, it weighed 1,400 pounds, and 15 men were needed to move it about! Lawrence had it hauled to Chicago, where he took pictures of the new train. The contact prints were eight feet long and four feet six inches high, magnificent in detail, clear as any studio-planned production. They were so startling, so unusual, that Lawrence decided to enter one in the Paris Exposition of 1900. The French art experts, after a careful scrutiny, denounced the photograph as a fake. No camera, they said, could make such a gigantic picture on one negative. An indignant Lawrence attacked them as amateurs, invited them to see his creation. The French Consul in New York went to Chicago, marveled at what he saw, and reported that the picture was indeed bonafide. The exhibit was reinstated and won for Lawrence the "Grand Prize of the World" for excellence in photography.

Photography had become George Lawrence's business by a quirk of fate. Born on a farm, February 24, 1868, in Ottawa, Ill., he left home at the age of 20, went to Chicago and landed a job in a wagon factory. He had a natural ability to draw, and as a spare-time activity in Chicago began to make and sell enlarged crayon portraits from black and white photographs. This side line prospered to the point where he decided to open a studio. For financial reasons, he rented part of the studio to a photographer, marking a turning point in his life. The photographer did little business and became so discouraged that he left to seek his future in some other field, bequeathing his equipment to Lawrence in lieu of unpaid rent.

Knowing nothing about his inherited paraphernalia, Lawrence picked up elementary knowledge about the camera, and of developing and printing, from a young man who had worked as a photographer's apprentice. Once he knew the rudiments, the Illinois farm boy, began a trial-and-error study to improve his technique. In the months that followed, he became (*Continued on page* 76)

ATOMIC ENGINES FOR AIRCRAFT,

The long road to the stars

is growing shorter but there are still

many obstacles we must overcome.

By T. S. DONALDSON

AIRCRAFT CAPABLE of circling the world several times without refueling—hypersonic speeds and extreme range—in vehicles of acceptable size and unlimited power for continuous acceleration or braking in space travel—this is the promise of atomic power in aviation. Even at that, it represents only a partial realization of the full potential. But this is the part of the promise about to be fulfilled—next year, within a decade, or within your lifetime.

We have known about the theoretical advantages of airborne atom power since 1945. We've seen successful tamings of the atom in huge turbogenerators for cities, and in the nuclear power plants of the Nautilus and Seawolf Submarines. Why are the aviation power plants lagging behind? How soon will they fling new craft across our skies? What types will they represent, and what will each be able to do?

THE RADIATION BARRIER:

The biggest single hurdle in our path to the atomic aircraft engine has been, and is, the hard radiation which is as much a part of the fission engine as the power it produces. Raw radiation from fission piles could be fatal to crewmen and disturbing to the electronic control system of unmanned craft. It can turn rubber brittle and even affect the strength of metal molecules. In fact, so potent is the radiation of even the smaller fission piles that the mere outline of the "shielding" problem seems to preclude a successful solution.

Picture it this way: about the smallest size within which we can now achieve a working reactor core is a sphere approximately three feet in diameter. You can, of course, rig up a reactor of sort within a sphere no larger than a foot across—but you wind up with a bomb, not a power plant. If you were determined to shield this reactor in the same fashion and to the same safety standards now in vogue on earthbound atomic power plants, the shield would tip the scales at 250 tons. The aircraft would need to be as big as the Empire State Building just to tote the weight of the shield around. As if that weren't enough, the smaller the core, the higher the radiation level for a given thermal output; and the higher the "power setting," the more intense the shower of irradiation.

No wonder, then, that "Engine Charlie" Wilson commented as late as 1953: "The atomic-powered aircraft reminds me of a shitepoke—a great big bird that flies over the marshes, you know, that doesn't have much body or speed to it, or anything, but can fly."

A Fairchild Engine and Airplane Corporation official put it differently, after that company had been made prime contractor for NEPA (Nuclear Energy Propulsion for Aircraft) back in 1947: "Our basic assignment," said he, "is to find out what *can't* be done."

Since, within the present state of the art, we can't build, much less fly, 1,000 or 2,000-ton aircraft, it becomes

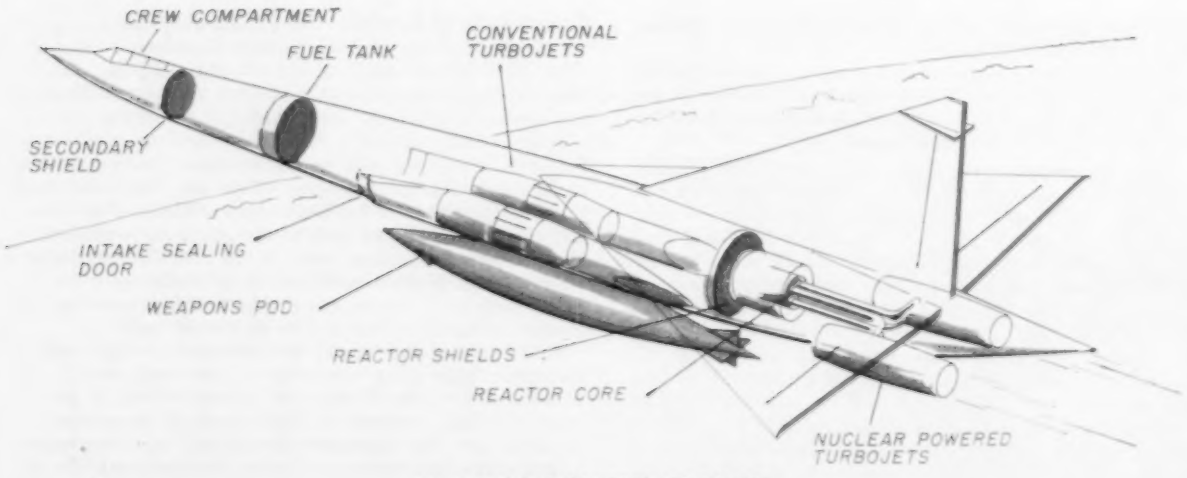


FIG. 1 NUCLEAR-POWERED JET BOMBER

Artist Cal Smith, who illustrated this article, envisions the aircraft of tomorrow.

obvious that we shall not be able to "solve" the shielding problem. However, we may be able to sidestep it.

One of the roads around the radiation barrier is to locate the crew and vulnerable electronic gear in a radiation "shadow" behind thick, but partial shielding. Instead of surrounding the hot reactor core with tons of lead and concrete to provide shielding from all directions, only those areas in line with crew compartments would be protected. Other parts of the aircraft could be steeped in radiation fatal to life, but not strong enough to drastically reduce the fatigue-life of metal. A corollary to the partial protection solution would be inclusion of auxiliary power plants for take-offs and landings. Only at cruising altitudes would the nuclear engines spring to life and scatter their rays about the aircraft.

Since sheer distance is a protection from radiation, it will pay our aircraft designers to elongate the fuselage to the point where structural limitations set in, and to place crew quarters and fission pile as far from each other as possible. With the weight of the engine and shielding mass at the extreme tail end, a canard or delta layout becomes almost mandatory, and attempts will undoubtedly be made to keep the fuselage cross-section as small as possible in order to reduce the girth of the radiation "plugs" between crew and engine.

Another refinement will serve to reduce the radiation level within the cabin to bearable levels: split shields. A thick, very heavy mass (probably lead) will rest against the reactor's front, and filter out the most deadly radiation. A much thinner screen will surround the entire core, sufficient only to guard the aircraft's structure—and a third heavy shield will seal off the crew, far forward in the nose.

It may even be possible to design into the atom-aircraft the kind of shielding that carries its own weight. It will be recalled that the craft will take off, climb, descend and land on conventional fuel burned by conventional engines. This would have been a very serious drawback some years ago, but the advent of jet engines with power-weight ratios of 5, 6, 7 and 8 to 1 (horsepower: lb. of thrust) makes this arrangement perfectly feasible. Even so, the mass of these engines might well be added to the more passive shielding between crew and reactor. The engines might be sunk into the fuselage, with lateral intakes in front and bifurcated exhaust pipe arrangements similar to the English "Seahawk" carrier-based jet's configuration.

Since good aeronautical engineers, like efficient meat-packers, try to utilize every part of the pig except the squeal, it is quite likely that even the fuel of the auxiliary engines might be brought into play in the battle against the rays. A disk-shaped tank of kerosene or AvGas would in turn help in absorbing some of the radiation, though

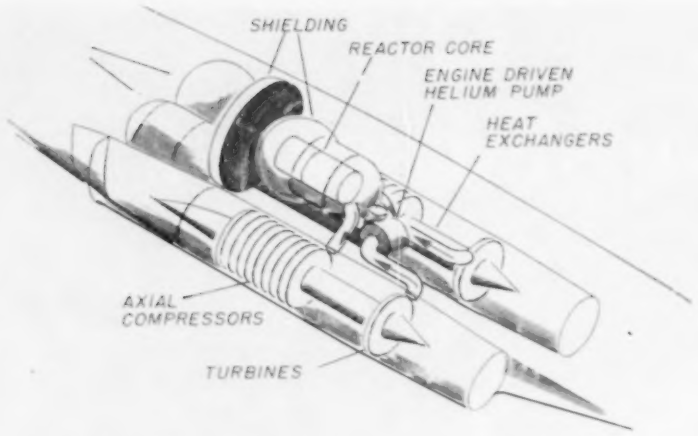


FIG. 2 ATOMIC TWIN-ENGINE LASH-UP

not as much as a tank of water of the same size.

Figure 1 shows a jet bomber configuration which embodies the elements sketched out above.

By judicious use of one or more of the anti-radiation devices discussed it appears likely that the nuclear-powered, low-performance aircraft can be made safe for its crew over extended periods. As the power requirements go up in relation to the airframe size and weight, the problem becomes more and more complex. We shall see later on what types of atom-powered vehicles are likely to emerge in the foreseeable future. One of them, the Mach 3-4 cruise bomber, may well call for an entirely new concept in air crews: pilots, navigators, bombardiers with a pre-determined, limited working span.

Each crew member would carry on his person a small dosimeter to record his exposure. He would train on the aircraft's gasoline-fueled engines, with just enough low-power fission-missions to familiarize himself with its operation. Perhaps even this short-time exposure could be limited through the use of simulators. Only in case of actual conflict would the reactor be turned on to full power, turning the aircraft into a supersonic battlecruiser, circling the world and striking its targets from directions denied to bombers with limited range. Its mission over, the nuclear bomber would head for home, controlled by a crew "redlined" against further fission-power flights for the rest of their lives.

TYPES OF FISSION POWER PLANTS FOR AIRCRAFT, MISSILE AND SPACECRAFT:

Since atomic power is basically a more efficient source of thermal energy, it follows that our skybound atomic engines will more often than not turn out to be familiar power plants with an unfamiliar source of heat. Nuclear propjets and pure jets fall into this category. These engines will utilize the heat generated by the controlled reaction in the fission pile in the same way gas or kerosene-fueled jets convert chemical heat energy into thrust, or shaft power, in the case of propjets. In lieu of combustion chambers, heat exchangers would raise the temperature of air compressed by a conventional compressor. The heated air would rush through a conventional-type turbine driving the compressor in pure jets, the compressor and propeller in propjets; and rush out the tailpipe to create thrust.

In design of the heat transfer to the atomic aircraft turbine's "combustion chamber," creative engineering of the highest order will be called for. The efficiency with which gases can be heated inside of the jet engine by the remote reactor will determine the performance of the aircraft. The most likely arrangement to date is a closed cycle fluid acting as a means of heat transmission. Here, turbopumps would push the fluid selected (current favorite: helium) through the hot reactor core, thence to heat exchangers in the engines, and back again to the reactor. It is estimated that temperatures around 1,000 degrees C. in the heat exchangers would be sufficient for turbojet or turboprop. A twin-engine lash-up of this type is shown in Figure 2.

This kind of propulsion arrangement is due to fly very soon—both here and in Russia. In its initial stages, its significance will be greater in the realm of propaganda than in military or air transport terms. It would be quite feasible, within the present state of the art, to take a large

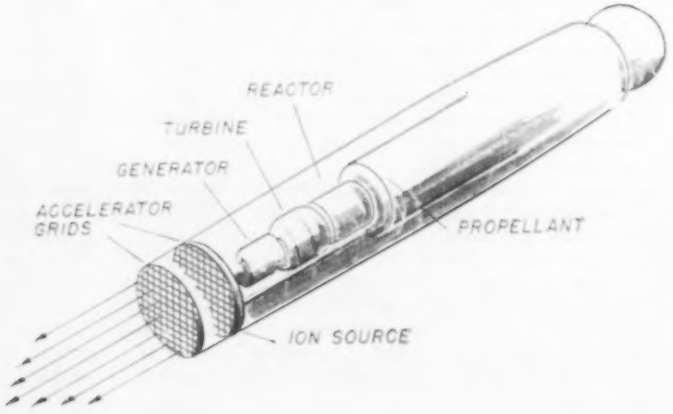


FIG. 3 THE ION PROPULSION ROCKET

aircraft now flying with conventional power, and jury-rig it with a fission pile. Such an aircraft would not really be able to trade on the advantages inherent in the new engine but some useful experience would be gathered, and the impact on world opinion would be the biggest payoff of all. Three aircraft are now being readied for nuclear conversion, according to well-informed sources: the U. S. is betting on the B-52, the Soviet Union is adapting a "Bison" long-range jet bomber. Both will retain their turbojet propulsion configuration. Rounding out the picture, and representing the propjet philosophy, is the British Saunders-Roe Princess flying boat. It is presumed to be readied for nuclear power under a joint Anglo-American project. It is significant that these three aircraft are all capable of lifting enormous payloads. This will be an important factor when shielding material is being considered.

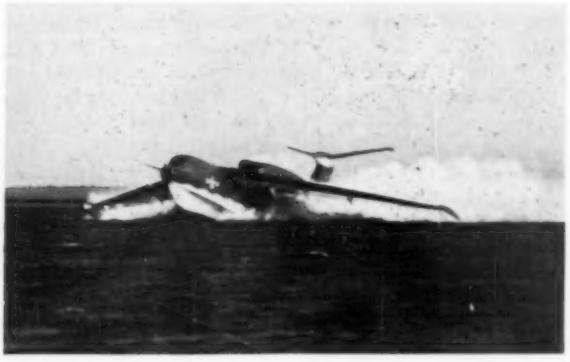
What kind of aircraft and missiles are likely to be propelled by the nuclear turbojets or turboprops?

Designed from the ground up to their new source of energy, these are the aircraft most likely to emerge:

The nuclear patrol bomber: the advantages of unlimited range in a bomber on anti-submarine patrol need no explaining. At the same time, peak performance need not be high, which greatly reduces the radiation and the shielding required to control it. In addition the oversea nature of the patrol bomber's mission will be welcomed in case of a crack-up. The crash landing of a fission-powered aircraft could be rather hair-raising.

The nuclear patrol bomber will probably turn out to be a flying boat propelled by turboprops. A flying boat permits take-off runs more generous than those permitted to a land-based plane, and landings in particular will be critical since landing weights will not be significantly under "maximum gross weight." Turboprops are logical because in the speed range required by a patrol bomber, they are more efficient than their pure jet counterparts. One of the configurations suggested for an aircraft of this type would feature a closed-cycle turbine linked to a gas-cooled reactor, with helium as the "working fluid." The helium would be heated in the reactor, and then itself released against a power turbine connected to the propellers, after which it would be piped back through the system to repeat the cycle.

The nuclear bomber: this aircraft type has been previewed at some length earlier on, as well as its missions. Equipped with 2-4 pure jet turbines, its endurance would be measured in days, its top speed around Mach 3.5, its ceiling around 75,000 feet. Its "horsepower," measured in heat output of megawatts (MW), should be around 90 to 120 MW. By contrast, the heat output necessary for a patrol bomber weighing about 100 tons could be as low as 30 MW. In various guises, it could act as missile, carrier, photo, radar or infrared reconnaissance ship, or as an Electronic Countermeasures vehicle.



The Navy candidate for nuclear power is the P6M Martin Seamaster.

The British Saunders-Roe Princess flying boat, powered with ten Bristol Proteus turboprop engines is presumed to be ready for nuclear power.

The nuclear transport: this is one of the most challenging assignments yet handed the aircraft designer. This type of aircraft is probably quite far off—may have to wait for entirely new shielding devices, or perhaps a different kind of nuclear power altogether, such as fusion energy. The obstacles are, in part: • *large cabin volume* required in a transport makes it difficult to put distance between the passengers and the radiation hot spots; • *high performance requirements* will be likely, as the nuclear transport will have to compete with conventionally powered craft of sonic or supersonic cruising speeds—this in turn raises the radiation level; and • *crash complications* can be downright frightful. Fission products could escape from the core, and contaminate a wide area; the fission core could break out of its shield and prevent rescue crews from approaching the scene of the crash. Worst of all, if the reaction was still "on" at the time of the crash, as in the case of a mid-air collision, for instance, the cooling process would be disrupted, and the core would melt, perhaps vaporize in part. Airborne radiation hazards could endanger many square miles in a peacetime fall-out catastrophe.

In all vehicles described until now, refueling must be a part of their operation. Contrary to popular fancy on this subject, nuclear fuel for aircraft does not last forever. If pure fissile material such as uranium 235 is used in order to keep the core size down, endurance may be limited to ten to 20 days. After this period, fuel must be taken from the core, the fission products removed, and new fissile material must be added for the next long flight. All of this will need to be handled very gingerly, and at more than arm's length. Huge robot manipulators similar to those in Oak Ridge will do the dirty work, and the grease-monkeys of the atomic aircraft will be a group of white-coated experts controlling the operation by periscope or TV from behind thick concrete-and-lead walls.

Atom-powered missiles, on the other hand, will do very well on only one charge, and will never need another. Their only trouble at this stage of development is competition from their chemically fueled contemporaries. We know now how to build (1) A turbojet, kerosene-fueled, 5,000-mile missile (the Northrop Snark and the Fairchild Bull Goose); (2) A ramjet-powered 5,000-mile missile capable of sustained Mach 2-3 cruise (the North American Navaho). It is difficult to see where atom-jet power can significantly improve their performance.

Chances are, we shall have to wait for *The Fission-Powered Ramjet* before air-breathing, nuclear-fueled

missiles take to the air. This is a most promising engine type which in turn depends to a great extent on the use of in-engine reactor. A-powered ramjets will require about 2,000 degrees C. in the "flame-tube" for reasonable performance. It will be difficult to pipe this kind of heat from a remote reactor, so the solution appears to be a fission core sunk right into the high pressure airstream racing through the ramjet. New ceramic cores and ceramic fuel elements show the way to significant increase in operating temperatures, and may bring the atomic ramjet closer. They may also turn up in the "combustion chambers" of fission turbojets and turboprops.

It will be necessary to coat the fuel elements with a protecting element to seal them off from the air passing through the ramjet—otherwise our engine would leave behind an unpleasant trail of radioactive air. Even so, our atomic ramjets are apt to remain more radioactive than their reaction-turbine counterparts, and as a result, will not at first appear as power plants for manned aircraft.

The code name Pluto designates the first U. S. project to create a workable fission-ramjet. Actual test runs may take place next spring on the installations at Jackass Flats, where work on the atomic rocket power plant is also going on.

The great promise of the nuclear ramjet is its very high altitude, very high speed performance—for days on end. It is quite conceivable that the refined versions of such engines will be capable of propelling manned or unmanned craft to Mach 8 at heights of 250,000 to 300,000. The negligible "fuel consumption" of the nuclear ramjet, plus the very high temperatures possible with the ceramic core, account for its great potential. The military vehicles it will hurl across the skies of tomorrow will occupy an interim position between the Mach 3, chemically-fueled, B-70 bomber type, and the Mach 14-18 ballistic missiles. Manned or unmanned, they will represent a formidable threat.

It will be remembered that ramjets, fission-heated or kerosene-fueled, do not operate at all when their vehicle isn't moving, and not really efficiently until Mach 1.5 close to the ground. Thus the atomic ramjet needs a solid or liquid-fueled rocket booster to accelerate it to operating speeds. In this respect, however, the fission ramjet is not much worse off than the fission turbojet; neither can operate from the ground on up because of the radiation they scatter about them when they are turned on (or "go critical" as the physicists like to put it).

The U. S. is betting on the Boeing B-52 for conversion to nuclear power.

The Nuclear Rocket, too, is about to be tested at Jackass Flats—and at some remote spot in Siberia, if the rumors seeping under the Iron Curtain can be believed. In practice, this power plant will not be the controlled A-bomb suggested by countless science fiction tales—not at first, anyway. Rather, it will be just another, highly ingenious way of putting reactor heat to good use. A working fluid will be injected into the core of a fission pile located near the rocket's exhaust. The heat from the nuclear chain reaction will expand the fluid, cause it to escape through a conventional nozzle, and in escaping create the "equal and opposite reaction" which Newton first formulated some centuries ago.

Performance increases in rocket engines are intimately linked to the speed of the rocket's exhaust. The faster the exhaust speed, the better the performance—or specific impulse, as the rocketeers like to call it. In an atomic rocket, the reactor's heat output is one factor determining thrust (or exhaust velocity); the other is the molecular weight of the working fluid. The lighter the fluid, the faster the exhaust velocity will be. The liquid most likely to be selected for this important role is liquid hydrogen. Its lightness makes it an ideal choice; its fantastically low boiling point (—259 degrees C.) turns it into the most ideal reactor coolant imaginable. This advantage has its reverse side, too. Liquid hydrogen boils away so easily, is so difficult to store that bulky, complex fuel tanks will be required. The recent development of liquid hydrogen variants—the parahydrogens—suggest that this problem may no longer be as grave as it once appeared.

In addition to very high exhaust velocities (there are no theoretical limits to the heat attainable in a nuclear rocket) this type of power plant offers the tremendous advantage over its chemically-powered rival that no oxidizers have to be lugged around in addition to the fuel. Since no combustion takes place, no oxygen is required, and every bit of the tankage available can be used for propellant fluids. No wonder, then, that the nuclear rocket offers dramatic gains in performance over present types. In terms of specific impulse, the nuclear rocket of the type described promises a threefold gain over present day rockets, and a 150 per cent improvement over the most efficient fuel-oxidizer combination now contemplated (liquid hydrogen/fluorine), a devil's brew too unstable to be practicable at this time.

Just as the nuclear ramjet will be literally hotter than the nuclear turbojet, so the fission-powered rocket will represent another jump in thermal energy. While the designing of a reactor core capable of withstanding the high temperatures is still a major engineering problem, there is no visible limit to the thermal level possible from nuclear power. With the high exhaust speeds possible to the nuclear rocket, the absence of the heavy, bulky oxidizer and tank, the future looks very bright for this type of vehicle. Not necessarily the best possible configuration for long range missiles (by the time the nuclear rocket is far enough along, progress in solid fuels combined with the ever-lighter warheads will make the solid-fueled ICBM the most economical choice) the nuclear rocket will really come into its own as a space vehicle.

Single-stage rockets of this type will be capable of lifting

heavy masses into orbit around the Earth, or fling them into interplanetary space. In all probability, however, few nuclear rockets will take off without a thrust assist. A chemically-fueled booster would lift them off the ground, then drop off, and let the atomic engine take over at a height where the radiation would no longer endanger earthbound life.

A typical rocket of this type is shown schematically in Figure 4. With a gross weight of about 100 tons, it would be lifted by a short-duration solid fuel booster developing approximately 300,000 lbs. of thrust. A 2,000 MW reactor would heat the liquid hydrogen from its tank temperature near absolute zero to an incandescent 5,000 degrees F. Leaving the exhaust nozzle at fantastic speed, the white-hot cloud of hydrogen gas would develop about 500,000 lbs. of thrust—over a long enough period to lift several tons of payload into orbit, or to hurl several hundred pounds up to escape velocity and into outer space. By comparison, the conventionally-fueled Atlas, similar in weight and size to our hypothetical, nuclear rocket, is incapable of achieving orbiting speed without the addition of two to three extra stages, and could accommodate a far lighter payload only.

This, then, is the payoff of project Rover, the code name for our first nuclear rocket engine. Dozens of firms are now bidding for a share in the Rover project, and a number of them are doing research and development work of their own. So far, the only official contractors announced are Aerojet General, Rocketdyne, Edgerton, Germeshausen and Grier, and the University of California, contract operator of Los Alamos and Livermore Laboratories for AEC.

A hint of the long-range potential of the nuclear rocket comes from General Dynamic's idea-spouting Krafft Ehricke. He foresees a manned nuclear rocket designed for interplanetary travel. It is particularly promising in that it includes a solution to the radiation problem which does not involve heavy shielding. Taking off under chemical rocket power, the vehicle, with a gross weight of several hundred tons, would feature a doughnut-shaped crew cabin nestled around the nozzle of the nuclear engine. After the last stage of the chemical boosters has burned its fuel and separated from the nuclear space ship, the crew cabin would be jettisoned in turn, and trail the ship by 1,000-3,000 feet. Cables would connect the nuclear locomotive to its remote caboose, and would carry its commands to the rocket and its controls. After the cables had been fully unreeled, the reactor would be turned on, and the now-deadly rocket would fly off into space, tailed at a safe distance by the capsule and its occupants. To land on, say, the Moon, the rocket and its follower would swing about, using the engine to slow down until lunar gravity is nearly canceled out and the capsule sinks to a gentle halt. As soon as the torus-shaped cabin hits the moondust, the rocket overhead would be made to drift sideways until it came to a tail-sitting stop some 1,000 feet away. To return to earth, the procedure would be reversed, the rocket rising first and sidling along until it could hoist the cabin off the ground from directly overhead.

At no time would the crew have been close enough to the active reactor to be in jeopardy of its raging radiation.

Still more ambitious than the atomic rocket, much further still in the future, yet still within the life expectancy of most of us is the *Ion Propulsion Rocket*. Suitable only for outer space because of its very adverse thrust weight ratio, about 1,000 times smaller than the conventional rockets of today, its fuel consumption would be so negligible as to permit months, even years of acceleration or deceleration. While it requires a whole number of technical breakthroughs before it can be realized, its principle is well understood. An atomic reactor far smaller than the one required for a nuclear rocket of the same size would generate heat to drive a turbine, which in turn would be hooked up to a generator to produce electricity. The generator would feed a high voltage across parallel grids which would accelerate ionized fuel atoms to fantastic velocities.

The acceleration would be very slow, imperceptible by human senses, because the mass of the ejected matter would be so small. Slow and steady is what does it, though, if you're doing your traveling by ion rocket. The 100-ton vehicle shown in Figure 3 could hit a velocity of 100,000 mph after half a year of building up steam—and

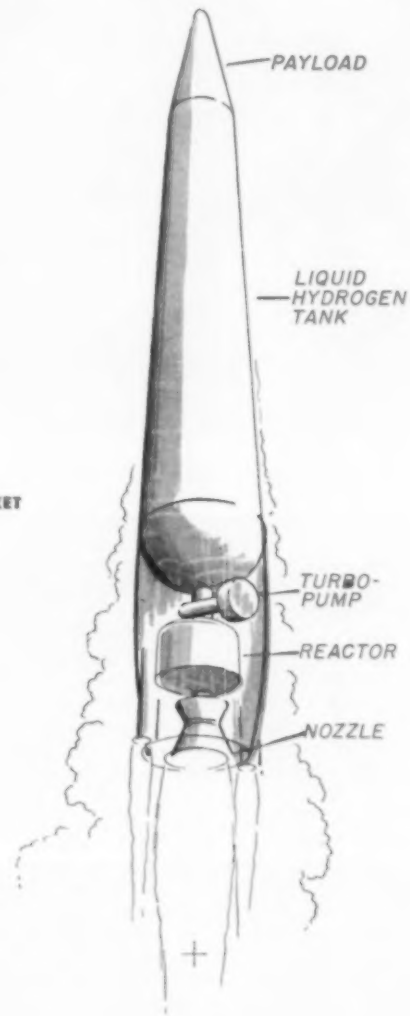
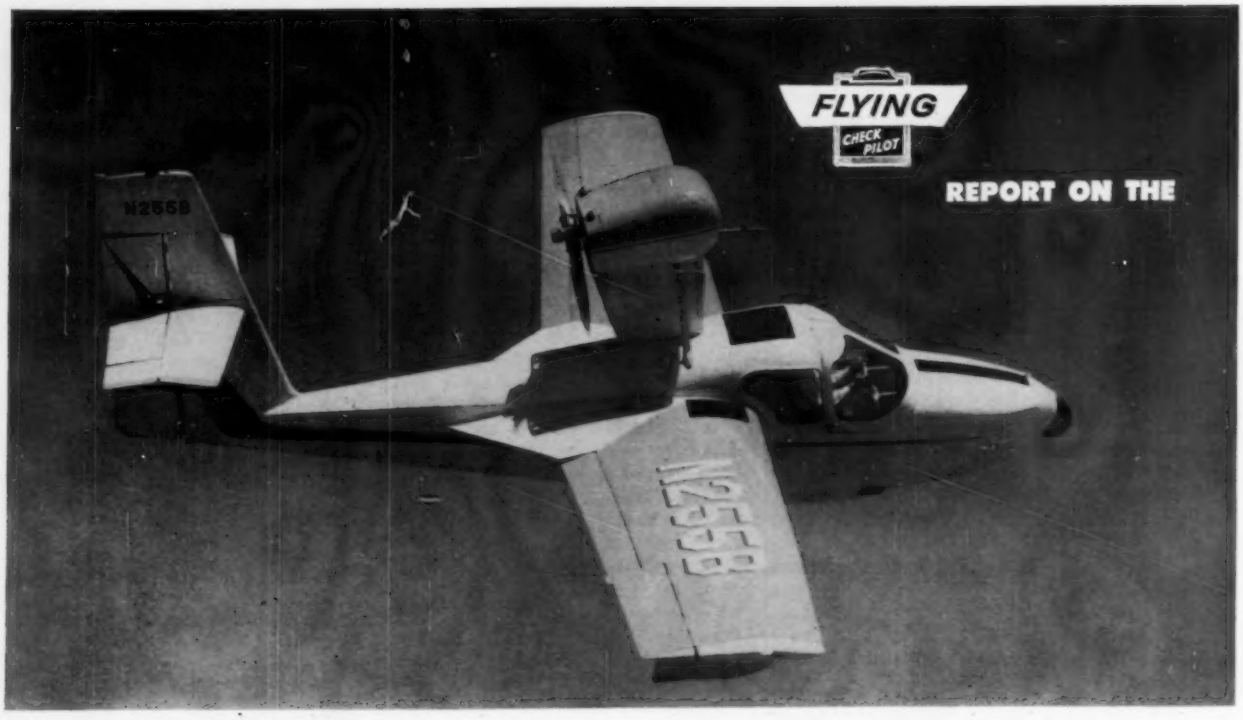


FIG. 4 THE NUCLEAR ROCKET

speed. It will take just as long to decelerate, or brake, at the halfway mark to the vehicle's destination.

Fast as the ion-propulsion rocket is potentially, it suffers from two severe drawbacks. Its operational activities will forever be confined to the gulfs between the planets, as it does not have the muscle to fight off heavy gravity; and it accelerates too slowly for the final human adventure: the long journey from the solar system to another star. That engine, that power will be discovered too, you can be sure. Only if mankind is struck down by the might of atomic power of the uncontrolled variety will it interrupt its progression on the long road to the stars. END



FOUR-PLACE, single-engine amphibians virtually disappeared from the market several years ago, except for a few used Republic Seabees. The tenacity with which these few have been kept flying hinted of the need for such a type. However, its design is not simple. Criteria for a boat hull amphibian call for both aero and hydro dynamic integrity.

The machine must have both good flying and boat characteristics, and these must blend harmoniously because during take-off or landing, there is a marked transition from watercraft to aircraft and vice versa.

Hull stability is important since there should be no tendency to dig in or porpoise upon contact with the water or while taxiing. Water stability depends on two main factors, proper hydrodynamic design of the hull and center of gravity location. The CG must be so located as not to affect adversely either the hull or flight stability.

Performancewise a modern amphibian needs good speed, range and load capacity to satisfy the market. Because of its bulkier shape and therefore greater weight and drag, streamlining plays an exceptional role in winning acceptability.

Such factors as these accrue high design and engineering costs to the amphibian—higher than for a landplane of similar size and power. But compromises in design, to keep price down have never worked out. Only the right solution can produce a first class article.

It is not surprising that aircraft manufacturers have shied away from this very useful and versatile aircraft or that the history of the single-engine amphibian is not a happy one. From a business point of view, it lists more failures than successes. However, presently, there is definite indication that the tide is turning, sparked principally by the Colonial Aircraft Corporation of Sanford, Maine.

Founded in 1946 by David B. Thurston, an engineer from Grumman and Herbert P. Lindblad from Republic, the corporation decided as a spare time project to design and build the three-place Skimmer C-1 amphibian, at Deer Park Airport, Long Island, N. Y. In 1955, after interruption of all spare time activity during the Korean War, the company moved to their present quarters in Sanford, Maine, and put the Skimmer C-1 in full production. Twenty-five ships were delivered to customers. The latest model, the four-place Skimmer IV, is an evolutionary step to extend the utility of the amphibian. It was granted a Type Certificate by CAA on December 19, 1957 and is now in production.

This Check Pilot Report on the Skimmer IV, Model C-2 became possible when Jack Strayer, president of Amphibious Aircraft, Inc., Teterboro Airport, N. J., placed a plane at our disposal.

The aircraft is an all-metal, shoulder-wing monoplane, powered by a 180-hp Lycoming 0-360, mounted on a streamlined pylon above and behind the leading edge of the wing. It turns a forged dural Hartzell constant speed pusher-prop. The moderately tapered, 34-foot span wing is of monospar construction with a torque box section outboard of the landing gear. As the fuel tank is located in the hull, behind the baggage compartment, and not in the wing, great strength and rigidity has been achieved in the wing structure, without the penalty of excessive weight. The slotted NACA trailing edge flap occupies 80 per cent of the span; wing tips are formed of shock resistant fiberglass plastic.

Landing gear and flaps are hydraulic and the nose wheel, when retracted, extends partially from the bow serving as nose bumper. The hull has four watertight compartments and is covered with heavy gauge dural skin, especially on the bottom where .051 sheet is used. All wing and hull skin is preformed, allidined, zinc chromated and lap joints coated with sealer prior to final assembly.

One of the most interesting features of the Skimmer is the elevator trim control. It is not a tab set into the elevator, but two hinged surface located at elevator tips. Hydraulically operated from the cockpit, they do not influence the action of the elevator like a trim tab, but act as

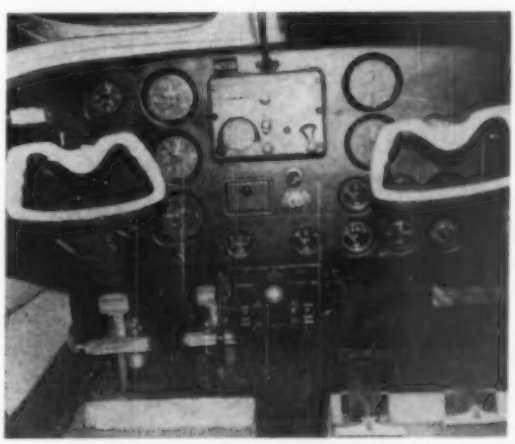
SKIMMER IV AMPHIBIAN

Lively performance and remarkable handling characteristics on water have rightfully earned it the name of agile amphibian.

By GEORGE LAMBROS, JR.
President, Lambros Seaplane Base
AS TOLD TO ALEX DAWYDOFF

Check pilot George Lambros, Jr., in the cockpit, gets a few pointers from Jack Strayer on Skimmer handling techniques.

The Skimmer shows off its good hydrodynamic hull characteristics during take-off. Wing and tail are completely free of spray.



Dual control wheels are optional. Flap and gear selectors are below center of panel with emergency hydraulic pump in middle.

trim surfaces, or small independent elevators. This arrangement was dictated by the large trim changes occurring with application of power—due to engine location; effect of the slotted flaps and the speed range of the airplane.

Ready to go, preflight inspection was our first move. All amphibians have drain plugs in the bottom of the hull. A check of them is imperative. The Skimmer has two such plugs in the bow compartment and one in the low portion of the hull, by the step. To check the hydraulic reservoir and the battery was a cinch. Each is located in a separate compartment in the bow and can be serviced by unlatching two covers on the nose deck. The gas tank drain plug is in the lower left side of the hull. A cupful should be run out prior to take-off. Oil dipstick and filler are accessible by swinging up the front section of the engine nacelle. Here are located also some of the engine accessories, and the oil radiator.

As the Skimmer's center of gravity is back just ahead of the step and approximately in line with the leading edge of the engine pylon, the ship's nose is easily picked up by one man and the entire airplane pivoted.

Entrance to the Skimmer is made through the hinged upward swinging windshield and a step on the hull's spray rail. The rear seat is gained by sliding the two front ones forward. The cabin is surprisingly roomy. Rear passengers sit comfortably, their feet resting in deep footwells. The upholstery in our Skimmer was of pleasing cream and brown waterproof plastic.

The baggage compartment is reached by folding the back seat forward and accommodates up to 60 pounds of luggage. All seats in the plane are quickly removable so that it can be converted to a cargo or ambulance craft in a few minutes.

Standard instrument equipment consists of basic flight and engine gauges, sensitive altimeter rate of climb, stall warning indicators, manifold pressure gauge and fuel pressure indicator. The N255B had a full instrument flight

The cabin is roomy and attractive. Note overhead location of throttle and engine controls. Fuel selector is behind rear seat.

panel and a Narco Superhomer. Flap and landing gear controls are on a flush console below the center of the instrument panel. The gear selector lever is on the left with a small wheel at the end; the flap selector has a flat tab. This sensory coding of the selectors eliminates likelihood of error. Flap and landing gear position lights are alongside the selectors. Gear lights are so designed that all three wheels must be either up or down before the lights go on. In addition there is a visual indicator for the nose wheel. An added safety feature and tribute to the plane's visibility is that the main gear position can be seen from the cabin. In the center of the console is a telescoping manual emergency hydraulic pump.

With exception of the master ignition switch, all others including circuit breakers are ranged in a straight line on the left cockpit wall below the entrance hatch. These serve the battery, generator, fuel pump, hydraulic pump, the red flasher beacon, navigation and landing lights. Directly below is the lever which raises and lowers the rudder used for water maneuvering. It retracts into the bottom of the air rudder when not in use.

On the floor, between the front seats is the trim actuator. Rudder pedals, on the pilot's side are equipped with two brakes, the ones on the right side are not. The fuel selector valve is on the rear cabin wall and, as the airplane has only one gas tank, of 40-gallon capacity, the selector has only two positions, *on* and *off*. Throttle, carburetor heat, mixture and propeller controls are mounted overhead within easy reach of either pilot or co-pilot.

For my first sortie in the Skimmer, I took the left seat, with Jack Strayer coaching the starting procedure. Firing up calls for mixture rich, carburetor heat cold, propeller in flat pitch. Battery, generator and fuel pump switches are then turned on and we waited for the fuel pressure to come up. As the day was warm, the throttle was pumped four times—more strokes are required on a cold day. When the pressure came up, the starter was engaged. No, we have not forgotten the ignition switch. As the engine turns over several revolutions the master switch is flipped to "*on*" and the Lycoming comes to life. Then the hydraulic pump is switched on. The hydraulic gauge should indicate 1,250 psi. The pump stays on but cuts out automatically when pressure reaches 1,250 psi and restarts when indication drops to 800 psi.

Taxiing to the runway I left the windshield open. Either side of the canopy can be left thus when taxiing on land or water. The ground ride of the Skimmer is firm but not harsh and the wide landing gear has excellent ground stability. Turning is accomplished by using brakes or rudder. The nose wheel is not steerable but swings through a 30-degree arc. As soon as ground speed of approximately 15 mph is attained, maneuvering is easy by rudder alone. Sharp turns can be made at a fast clip by holding one brake without any evidence of creep. Trimmed for take-off and after clearance by the tower, I flipped the parking brake handle off and advanced the throttle to 2,700 rpm and 27 inches of manifold pressure. Acceleration was rapid—in less than 400 feet of run, the Skimmer was airborne. Weather conditions were—temperature 70 degrees F., with a light crosswind of six mph from 45 degrees.

Immediately upon breaking ground, gear was retracted and power reduced to 2,600 rpm and 26 inches of manifold. The nose was raised and an indicated air speed of 75 mph attained. In this configuration (*Continued on page* 78)

Taxiing up ramp of Lambros Seaplane Base, the Skimmer shows off its wide landing gear. One trim surface is seen here, at extreme tip of elevator.

A true account of a three-day air show in the early Twenties which turned out to be an

OX-5 HOLIDAY

By RUSS BRINKLEY

OF THE COLORFUL PILOT personalities who hit the cow pasture circuits in the stick and wire era, the early 1920's, none provided more headline antics than Parker D. "Shorty" Cramer and his scientific minded partner, Jack Bartow. I was one of their grease monkeys—paid by dual instruction.

Cramer and Bartow, as their elaborate stationery announced, were the Clarion Flyers, their base being the intermediate air mail refueling field, midway between Hadley Field, N. J., and Bellefonte, Penn. It was there that they assembled their war surplus loot and turned old propeller hubs into clockstands, many of which still decorate the mantels of Clarion homes.

For the first few months of their operation, it was not difficult to lure adventurous passengers into their OX-5 Canucks, Jennies and Standards at rates up to $25 a ride. Then, when the cream of the prospects was exhausted, the rates were gradually reduced to where even a dollar a head or a penny-a-pound failed to attract business.

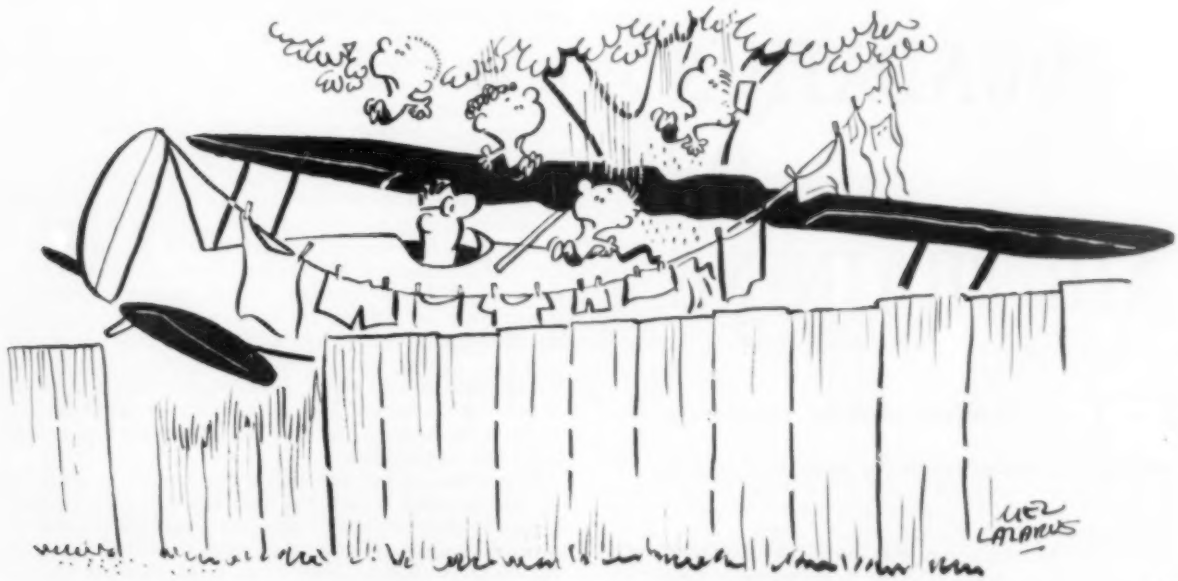
By this time, the pair had established credit with a restaurant but, as winter wore on, both their credit and the patience of the creditor became stretched to the breaking point. Eventually, one morning in early spring the matter came to a head. The birdmen were given the alternative of paying up or moving their patronage to some other beanery.

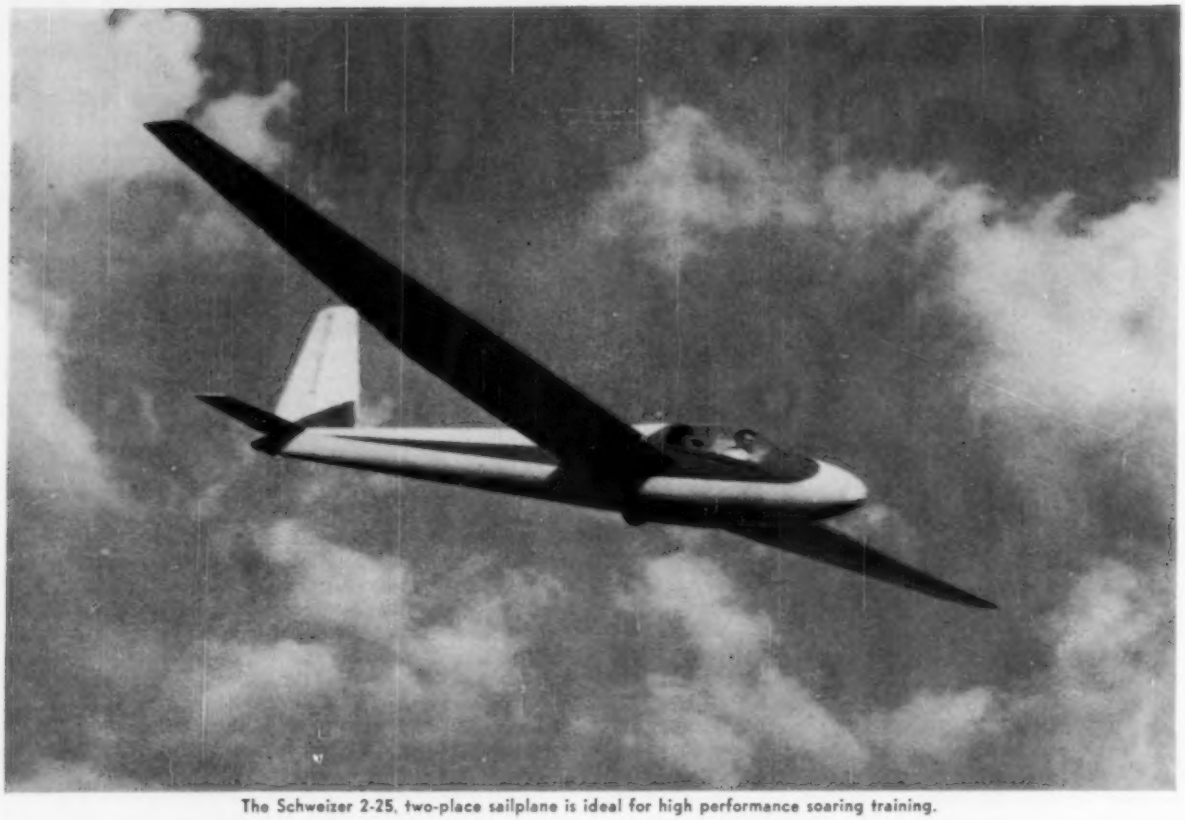
Luck was with the flyers on that particular morning. The weekly paper, on which I was a cub reporter, carried a front page announcement that Clarion merchants were planning a three-day promotion sale and a "special attraction" was being sought to lure the citizenry to the county seat.

Cramer lost no time in getting to the newspaper office to make a deal with the editor who was also secretary of the local aero club. Within an hour, Shorty had contracted to stage a three-day air show, as the special attraction. He talked real fast when he learned that $300 had been appropriated for it. For that $300, the merchants' committee was assured of a flying program guaranteed to leave the customers breathless. There would be a half hour of stunt flying, climaxed with a parachute jump on opening day. The second day would feature a hair raising flight under the new steel bridge which spanned the narrow Clarion river. The main show would be on Saturday, when Red Jack Bartow would attempt to take off in his converted Thomas Morse OX-5 Scout, from the main street of the town.

Two weeks of plugging the big event resulted in a banner crowd on opening day. Many of the outlanders hadn't been to town during the entire winter. They spent money, grabbing up bargains, stashed their purchases in buggies and Model T Fords lining the streets and awaited the appearance of Cramer and Bartow in their stunting planes.

Promptly at 3:00 p.m., a Standard and a Canuck roared up Main Street low enough to see the whites of their eyes. For the next half hour, the crowd cheered continuously as Shorty and Red went through (*Continued on page* 68)





The Schweizer 2-25, two-place sailplane is ideal for high performance soaring training.

THE FOUNDATION OF AIR TRAINING

Gliding training provides a perfect means of selecting potential pilots.

By G. E. ROBINSON
Wing Commander, R.A.F.

THE BIRDS, THE SOURCE of man's inspiration to fly have two ways of traversing the air; by flapping their wings; and by soaring on air currents.

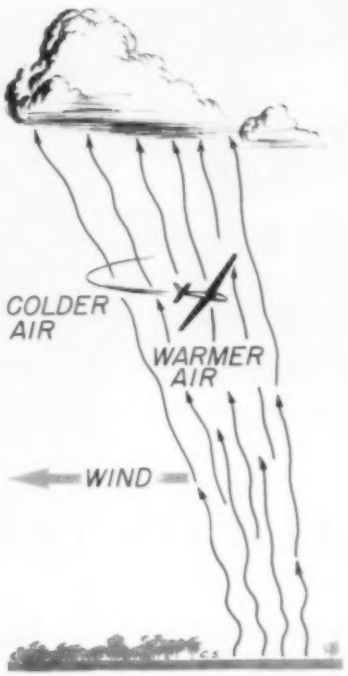
It is extremely interesting that man had to wait for a source of power, the equivalent of flapping wing flight in birds, before human flight became a reality. Why wasn't a soaring machine developed ages ago?

In perusing history for an answer, it becomes obvious that several factors intervened. First, man had to discover that there was such a thing as bird soaring; secondly, having discovered that fact, he had to work out the mathematics of air motion; thirdly, he had to build a soaring wing and devise a method to control it.

On the first point—the discovery of soaring flight—two eminent scientists of the past had differing theories. Leonardo da Vinci knew that birds could gain height on fixed wings and wrote a dissertation on the principle in 1500. Unfortunately, his writings were lost to the world for some 300 years. Giovanni Borelli, in 1680, published a classic work on "Animal Locomotion." In it he expounded the theory that birds could maintain or gain height only by virtue of momentum previously acquired by flapping of wings. Due to loss of the da Vinci writings, this theory became the accepted one. From then on until the turn of the 19th century, the true scientific theory of soaring flight lay discredited.

Resurgence of the scientific truth was due to a handful of men amongst whom was L. P. Mouillard whose book, L'Empire de l'Air, published in 1881, inspired the eventual modern pioneers, among whom were the Wright brothers. Others were Otto Lilienthal and A. M. Herring who, be-

tween 1893 and 1896, actually soared crude wings for up to 48 seconds. Although many of these pioneer flights were accomplished on atmospheric currents deflected by irregular ground, the pilots knew there were other air currents which could support their machines—in modern terms these currents would be called thermals, large bubbles of heated air rising from the ground. Such knowledge was then remarkable. Even today many educated people do not grasp that an object can move upwards relative to the earth while at the same time it moves downwards relative to the air in which it is supported—the basis of soaring flight.



The principle of soaring in a thermal current.

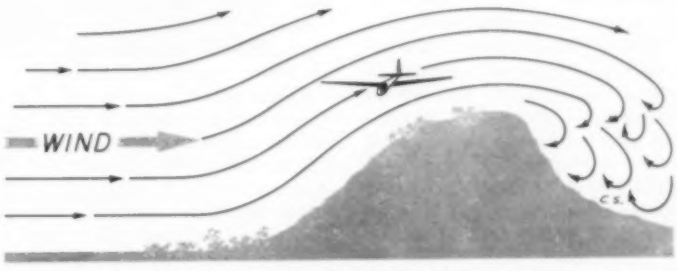
The relatively swift evolution of powered flight and the heavy emphasis on power for utilitarian purposes relegated the soaring aspect to secondary consideration. Following WWI, it had a resurgence stemming from restrictions imposed on Germany's power flying. Editor of the aviation magazine, "Flugsport," the educator, Dr. Oskar Ursinus, determined to keep Germany in the air somehow and, in the summer of 1920, called a meeting of airmen, scientists and educators. This meeting, which lasted two months and included demonstration flights, could possibly be regarded as the rebirth of the eclipsed form of flying conceived by the early pioneers.

Through force majeure, the Germans used the soaring element of airmanship to great advantage. The bulk of the Luftwaffe pilots at the outbreak of World War II had initially been trained on soaring and gliding aircraft. No one can deny that these men thoroughly knew their business.

From that time forward, the performance capabilities of the motorless aircraft and of the men who have handled them has steadily increased. Sailplanes have reached altitudes of more than 40,000 feet. Cross-country flights in excess of 300 miles have ceased to cause acclaim. The endurance record aloft stands at more than 52 hours.

However, most people have continued to think of gliding and soaring as a sport, pure and simple. Nor has the prospect of space flight turned their thought seriously to the utilitarianism of soaring, although none will deny that superior airmanship will be more requisite than ever before.

The writer believes that in this they may be overlooking a sound bet. Airmen who will be required to operate more and more continuously on the outer fringes of the atmosphere should have the advantage of all the maturation they can absorb. Soaring provides airmanship training that can never be compensated for in powered flight. It can be initiated at an age earlier than can powered flight. Its economics adjust to training of youth better than do those of powered flight. And most important of all perhaps—gliding and soaring training is an unparalleled method to make early determination of the character fitness of the candidate to pursue a flight career on such frontiers as space now proffers.



Slope soaring utilizes the deflection of wind found along the side of a ridge.

Pilot qualities fall into three categories, namely (a) physical fitness, (b) aptitude for flying, and (c) character fitness. The first, physical fitness, can exactly be determined by the medical profession. The second, aptitude, does not present great difficulty; any good instructor can tell after a few trips in the air whether a pupil has aptitude for flying. The degree of aptitude may not so easily be determined, but in the initial stages of training this degree of aptitude is not of primary importance; if it is there, it is most likely to develop as air experience grows.

It is the third category—character fitness—that presents an extremely difficult problem in assessment. Character fitness has many components, the chief of which are intelligence, mental alertness, common sense, adaptability, perception, sense of responsibility, balance, self-confidence, morale and enthusiasm. All these components are intangibles, difficult to determine. However, they are vital in present day complicated machines and will be still more so in machines of tomorrow.

How can such intangibles be determined? No doubt a psycho-analyst could pinpoint many of them, but he would need time to obtain good results, and time for long clinical study of every potential pilot is not easy to obtain. Apart from this, young men undergoing such examination would be under tension, knowing that their chosen career was at stake. Although such tests are useful, they are not the most suitable means of determining character as applicable to a potential pilot. What is needed is a long, unconstrained observation within an aviation environment.

In gliding training, such observation can be made and inherent components of character-fitness developed, better than in any other known way.

It has been found that a gliding career can start at about 14 years of age, an important factor in the development of flying character. The longer a potential pilot is in a flying community the better trained he will be for ultimate responsibility. His instructors can assess accurately, over a long period of time, his potential as to the intangibles of character-fitness. If at any time a youth decides that a flying career is not for him, he merely retires from a sport, and is not found unfit for a job, an important factor in a person's own psychological make-up. Finally, (*Continued on page* 82)

By TED DUROSKO

Dorthy LeMay soloed the Tricycle Cub after 5:50 hours of dual instruction.

FLYING CHECK PILOT

CHECK PILOT REPORT:

J-3 CUB ON TRICYCLE GEAR

Student pilots find many advantages in this modified trainer.

FOR APPROXIMATELY $150 additional investment in each J-3 trainer, Tony Krall, who operates Yoder Airport, Louisville, Ohio, has given his student training program a shot in the arm. Presently some 30 students keep busy three J-3 Cubs which have been put on tricycle landing gears.

"They are fun to fly right from the start," commented one student. Another observed, "I don't have any trouble keeping it going straight on take-off."

Dorthy LeMay, a Louisville housewife who is taking up flying to co-pilot for her husband, soloed the Tricycle Cub after 5:50 of dual. "The visibility on the ground is excellent, a factor which gives a student added confidence."

Krall reports that his instructors have found the average student in the Tricycle Cub ready to solo about an hour sooner than those trained in the conventional J-3 Cub. They attribute this to the level or "in flight" attitude of the Tricycle Cub as it rests on the ground. This seems to bring about flight orientation much sooner. During his first hour, the student usually gets the hang of taxiing and, in the second hour, can move into the take-off phase.

Upon first hearing of Krall's switch to the tricycle gear for his J-3 trainers, I decided to go see for myself. On the Cleveland Sectional I found that Yoder Airport serves Louisville, Ky., and Canton, Ohio and is located about six miles northeast of the latter industrial center. It has one East-West runway, some 2,200 feet of well-drained turf. We found it a neat and well-kept airport and were introduced around to all hands, students and instructors, when we told Krall we wanted to appraise the use of the gear for a report to FLYING. Their reactions to the innovation were so favorable that I became eager to fly the Tricycle Cub myself. Krall detected my interest and pointing to one of the Cubs said: "Why don't you try it?"

It didn't take my photographer friend, Bob Neilsen, and me very long to get aboard. I noticed that, when flown solo, the Tricycle Cub is flown from the rear seat. Neilsen climbed in back there and I saw no tendency for the tail to dip. I climbed into the front seat. Krall spun the prop and waved us out.

As I pushed the throttle forward to get the Cub rolling, I could not but compare the ground visibility of the J-3 Tricycle and the conventional. In the conventional Cub, when taxiing, S-turns on the ground are essential and forward visibility does not manifest itself until the tail rises as the airplane streamlines itself. Taxiing the Tricycle Cub is also much easier. Though the nose wheel of the tricycle is not directly steerable by linkage, it is on a shock cord swivel. By applying brake on the main gear, the nose will swing immediately in the direction desired. When the load is lessened, the nose gear snaps back to the straight-away position.

When taxiing, I found that if the control stick is kept in the neutral position and the aircraft is moving slowly, there will be a tendency to "porpoise." When this occurs, there is a rather loud clacking as the load is relieved momentarily on the nose gear. The shock cords suddenly retract the shock strut and it hits the metal stop. To overcome the porpoising, the Cub can be taxied at a slightly faster than normal speed with a little back pressure held on the control stick. I think a fiber washer of some sort could be fashioned to dampen the clacking noise when the strut rams home.

Once lined up for take-off, I had a full view of the entire runway. To a student, this must be an assuring viewpoint. Bob, in the rear seat, said his visibility was good except for the area blocked by my head and shoulders. However, he could see around me and get a fairly good view of the entire runway ahead.

As the Cub gained rolling speed, I held slight back pressure on the stick. About the time the nose wheel grew light, the rudder became (*Continued on page* 86)

THE PRO'S NEST

Here is a recorded interview by the Weather Bureau with pilot J. A. Hudson, who flew within 800 feet of the Dallas

TORNADO

MY NAME IS J. A. HUDSON—I'm a charter pilot, commercial, and fly from the Highland Park Airport, Dallas, Tex.

Q. You were flying in the vicinity of the tornado the other day?

A. Yes. We had a warning from the Weather Bureau about the tornado. It had been sighted from aircraft when about 30 minutes, south southeast of Dallas. We'd been waiting ten years for an opportunity to photograph a tornado, and have been out numerous times but failed to get the picture. The tornado wouldn't materialize at the time we reached the area.

We finally got one of our photographers. When he arrived, the tornado was over Bachman's Lake. It had crossed south of Oak Cliff and a portion of South Dallas. We flew in the direction it was supposed to have traveled and intercepted it over Farmers' Branch north of Love Field about four miles.

It was aloft at that time and didn't have any appearance of touching the ground. It would form a tail and then the tail would dissipate. It took on that form several different times and continued aloft past the little town of Addison, about 12 miles north of Dallas. It began thereafter to take on conventional shape and contacted the ground three and a half miles north of Addison, cutting an extensive path through the farm area. There were three farm houses in its path. It approached the first house and, when within about 100 feet, made a semi-circle around it, then straightened back and hit the second house. It took the roof off. The roof wound around into the funnel and went up to about 300 feet in the air. The tornado then spit the roof out on the northeast side.

We approached the funnel from the south side as it was traveling almost due north at that time, and worked back and forth from east to west at altitudes varying from 200 to 900 feet. We moved in as close as 800 feet. The funnel was rather unstable. It drifted back and forth and we intended to get closer but it didn't look advisable since the main body of the spout swayed like a long dangling rope in the wind. At about 800 feet from the funnel we could feel the effect of its draw. The air would get extremely unstable and we did our close flying heading with the wind.

Q. You encountered turbulence then?

A. Yes, we began to pick up some turbulence but the airplane was more maneuverable heading with the wind. If you headed into it and then tried to turn away, the funnel had a drawing effect.

Q. Drawing toward the funnel?

A. It felt like we were being drawn toward the funnel but in approaching it, with the low pressure area on our left, we were following downwind and the plane would maneuver away from it much better. Sometimes, with a thing like that, you get illusions, but it seemed to affect the altimeter very rapidly when we drew in rather close. Estimating ourselves at about 200 feet in the air, it seemed that the altimeter fluctuated from 400 to 600 feet.

Q. Indicating lower pressure?

A. Indicating high altitude which is lower pressure. It seemed that the effect of the low pressure area was most pronounced from about 800 feet out and on into the core. At one time, we were possibly within 400 feet of the core. That's as close as we got to it and at that point the altimeter was affected, possibly by a plus 150 feet maximum.

Q. The altimeter would indicate a change in height?

A. It would indicate that we were ascending without ascending.

Q. Was it a rapid fluctuation?

A. Well, there was rapid fluctuation of about 25-40 feet. It would jump a little but was more or less constant because, as you'd pull in more closely, the altimeter would increase its reading. It would go up slowly, then would drop back, then go up again. I didn't notice any effect on my ears.

Q. Now, how about the width of the funnel?

A. Well, it varied from time to time. We followed it about 20 miles and left it because it completely dissipated. The width of the funnel was from 100 to 350 feet at its most effective point—where it seemed to most affect objects on the ground. It passed over two small ponds while we were following it. One of them was about 150-175 feet in diameter, almost round. The tornado covered the entire pond; suddenly the pond disappeared into the mouth of the funnel, which sucked it completely dry.

Q. Was there evidence of the water being thrown out?

A. It definitely went up into the funnel because momentarily while the funnel was over the pond, it grew dark throughout the funnel. At that time I was 800 feet above the ground. Had I been lower, I'd probably have seen the water disappear. I wasn't directly behind it, but I could see both the leading and trailing edges of the funnel mouth. It was traveling straight north at that time and I was to the southwest. It moved right in over the pond and when it passed on, the water was completely gone.

Q. That's a large quantity of water?

A. It may have been two or three feet deep; it may have been ten or fifteen feet; you can't tell from that altitude. It went over another pond—a larger one. The funnel didn't center it completely. It sucked the water out of one end and you could see water rush in from the other end.

Q. The water level in this second pond was lowered but the pond was not emptied because the funnel didn't pass over completely.

A. It was definitely lowered. The water was sucked out of the end over which the funnel passed. I'd say this pond was 300 feet long—and narrow; kind of tear-dropped at the lower end. The funnel passed over the tear-drop end, with the center of the funnel mouth just over the water's edge. You could see it suck up water which was immediately replaced by water from the other end.

Q. Now, how about your radio?

A. I was using high frequency and the tornado didn't seem to affect the radio at all. I didn't try low frequency. I was transmitting and receiving on 122.8 megacycles. They were in the same band, and I talked to Dallas Radio on 113.5; I received on 113.5 and I transmitted to them on 122.1 but there seemed to be no difference in radio reception. There was no static.

Q. How about static discharge off the airplane?

A. I didn't see any static discharge. I've been flying 27 years and have been in conditions where we had it. However, there have been only three occasions in 17,000 hours when I have seen static discharge very pronounced. One was in Africa, one over the south Atlantic and one here in the States. About five years ago one night, it was so pronounced that it lit up almost like a neon sign —danced all over the airplane.

Q. How about your changing winds as you approached and went away from the tornado? Could you estimate the wind speed?

A. It varied from 50 to 100 mph. I didn't get as close to it on the upwind approach, but on the downwind approach I pulled in rather close.

Q. You mean on the south side?

A. On the south side, yes. That was on the leeward side of its movement.

Q. You think the winds were around 100 miles per hour?

A. About 800 feet from it, I'd estimate the winds to be about 100 miles an hour. Probably 500 feet from it they more likely exceeded 200 miles.

Q. Now, how about turbulence?

A. It wasn't particularly severe. You could feel the effect as you'd move in toward the core. You could tell from the feel of the air that you'd come into the positive movement of the tornado. But I'd say that the extremities of the effect were about 800 feet from the core. It may have had effect farther out but I couldn't feel it. There was no ascent or descent effect from it. On the upwind side it seemed to pull in. It may be that, with a strong tailwind going downwind, I didn't notice that but it seemed to have an effect of drifting in toward the core as we headed upwind.

Q. How about lightning activity during this time?

A. I didn't notice any particular lightning activity; in fact, I don't even remember seeing any after we got near it. A little activity was observed when we were some distance away from it, but the lightning was not from the funnel cloud.

Q. Off to one side?

A. Not directly in the vicinity of the tornado.

Q. You said you got into the area when the tornado was just ending—the Dallas tornado—was ending in the Bachman Lake area?

A. It was north of Bachman Lake area before I reached its vicinity. In fact, I took off from the airport right after it left the Bachman Lake area and I'd say I intercepted it approximately three miles north of Bachman Lake. It was aloft then.

Q. Is this the same tornado?

A. The same one that passed just west of Love Field. I was watching it all the time. I watched it cross Oak Cliff; we had a good view of it from here at Highland Park Airport, nine miles north of downtown Dallas. It seemed that it was moving more westerly when it went into Oak Cliff. And we could see it on the south side where it appeared to be aloft. We could see the cloud but we couldn't tell much—the funnel would twist up but it was more horizontal than vertical and as it crossed Oak Cliff, it looped down, began to take on about a 45-degree angle and as it touched down nine miles away we could hear the cracking of the timbers.

Q. What was the approximate distance between the time the funnel lifted off the ground until it touched the ground again?

A. After it had passed Love Field, I'd say approximately 11 miles.

Q. Then it was on the ground for about eight or nine miles.

A. Say about ten or 12 miles it stayed on the ground.

Q. Then it lifted and stayed up?

A. It lifted and stayed up for approximately three minutes; then completely dissipated.

Q. What type of aircraft were you flying?

A. I was flying a Beechcraft Bonanza 225.

Q. Could you describe the cloud base in the vicinity of the tornado while you were flying around it?

A. It was typical of the tornado- (*Continued on page* 73)

S-62's V-bottom hull cushions impact on water landing, forces spray outward and down. Floats dampen the pitching and rolling.

Have you seen the new Sikorsky

S-62 AMPHIBIOUS HELICOPTER

By ALEX DAWYDOFF

SIKORSKY's latest helicopter, the S-62, eliminates all the problems hereto associated with water operation of rotary wing aircraft. Amphibious helicopters are not new but, basically, all of them are land craft equipped with flotation devices of one sort or another. Although the water gear has generally operated satisfactorily, there are certain disadvantages connected with it. It adds drag and weight to the helicopter robbing it of its full payload and speed and is inherently dangerous while alighting on water in auto-rotative, power-off, condition during which the craft enters water with forward speed. The cylindrical floats tend to capsize it.

The S-62, on the other hand, is an amphibious helicopter in the full meaning of the word, as well as the first in the world to have a flying boat hull. In addition it is powered by a gas turbine engine. (*Continued on page* 83)

Over the Housatonic river which flows past Sikorsky's Stratford, Conn., plant, the S-62 flares out in demonstration of auto-rotative landing.

NO. 222

A student pilot in Alaska finds out that you have to think ahead of your airplane.

I LEARNED ABOUT FLYING FROM THAT?

By GENE CECIL

I'M SURE FLYING RECEIVES manuscripts from all over the world but I wonder if this story written from my trapper's post in the dead of an Alaska winter might be the first from such a spot. In intervals between tending traps and caring for my dog team, I do a lot of hangar flying in my mind and try to reason out sound practices and procedures against the day when I get back to civilization and lay my hands on an airplane again.

Some people settle in Alaska due to an urge to pioneer. Some have the idea of making a fortune and others seek a sportsman's paradise. Still others journey up here just to see what the country is like and find such contentment that they remain. But, for whatever reason they come or for whatever reason they stay, they all reach one common denominator. Practically everyone winds up learning to fly or at least takes a whirl at it. There are no super highways and even few grade roads, so it's either fly or go by dog sled. After the latter transportation for two years, I decided to join the ranks of the airborne, but keep my dog team as well since their value is unlimited when it comes to covering miles of traplines.

In the fall of last year, I first tackled the job of becoming a pilot. On several previous occasions I had taken over the controls of an aircraft after it was airborne, but had never received any formal instruction. I was interested in joining a club and, checking at our three airports in Anchorage, decided on the Seven Star Flying Club. This is a non-profit outfit whose main object is to make planes available for instruction purposes. They have no club instructors, so my next problem was to locate one. Happily I fell into the hands of one of the best, Lyle Wheeler, a co-pilot for Reeve's Aleutian Air Lines, operating out of Anchorage. He said to meet him at the airport next morning since I was anxious to get started while the weather was fit for flying instruction.

Lyle briefed me on some of the things I would need to learn and introduced me to the Piper J-4 Cub. He had me follow through on the take-off and we cruised out to the practice area where he showed me various co-ordination movements. I was really getting the feel of the J-4 when Wheeler said we would have to quit for the day. I was disappointed that we couldn't stay up longer but Lyle promised he'd have me soloing the next day. And that's the way it worked out. In the two days, I put in eight hours and finally my instructor said, "Well, let's see if you can do it by yourself."

He stepped out and told me to make some take-offs and landings until he waved me in or until I wanted to stop. I was airborne so fast I couldn't quite figure it out and even on the first leg of the pattern was so high I put on carburetor heat and throttled back! After landing I told Lyle something was wrong. He laughed and told me it was because of his weight not being in the plane. I sure felt foolish.

Next morning we found the plane hadn't been gassed yet but had enough fuel in the tanks for a few touch-downs so we warmed up and took off. The tower wasn't in operation this early and we didn't have to receive a clearance. I shot three touch-downs and Lyle said to pull in. I landed and taxied back to the pumps but they were still not open. Lyle told me, if I wished, I could make two take-offs and landings. More wouldn't be safe with the scant gas I had.

I made one touch-down and, as I took off again, got an alternating red and green light, but couldn't see any reason for it. No planes were in the air, although, on the far end of the runway, Reeve's was towing one of its cargo planes around for loading. I presumed that must be the reason for the caution light and didn't think anything more of it as I proceeded around the pattern. However, as I approached again the red light flashed, so I added power, pulled out, and started the pattern once more. They were still playing with that cargo plane at the end of the runway. I completed my pattern and again received the red light. Now I began to get worried. The gas was showing lower all the time and there was certainly no place upstairs to get any. I thought perhaps one of my landing skis had broken and checked on (*Continued on page* 86)

MILESTONES IN AVIATION

Across the nation in 49 days

NEW YORK TO CALIFORNIA

THE BIG MAN, grinning around an ever present cigar, stepped quickly out of his battered Wright E-X and was immediately mobbed by a wildly cheering throng. The date: November 5, 1911. The event: Completion of the first flight across the United States. The man: Calbraith P. Rodgers.

This epic air journey, ending in Pasadena, Calif., 49 days after Rodgers took off from New York, was replete with mishaps that would have withered the courage of a less dedicated man. But this grandson of Commodore Perry, who opened the ports of Japan, was not daunted by hanging up in treetops on take-offs and landings in pastures amid uncooperative milk cows.

Rodgers missed by 19 days a $50,000 prize offered to the first man to fly from New York to California in 30 days. But as Rodgers put it: "Never mind about the money. I made the first flight across the country, didn't I?"

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AVIATION DIVISION • PHILLIPS PETROLEUM COMPANY • BARTLESVILLE, OKLAHOMA

Pilot Beyond Beyond

(Continued from page 26)

Shortly, we were traveling on the step—here comes the 30-degree turn—can we make it or will we skid into the opposite bank only a wing span away? Bury the right float; that should help. It did. The straight stretch on which we had landed was just ahead. The rest was easy. A circle over the new camp showed us that our party was surrounded by a swamp. It would be necessary to move them across the river to the east bank.

Next morning we dropped a rubber dinghy and a buoy that had to be anchored before we could attempt more landings in the swift current.

Three days passed and contact had not yet been made with the natives. During the transfer of supplies across the river—while the small force was divided—the natives finally came. At the site picked for the new camp across the stream, warriors approached with their 15-foot spears leveled. At the old camp another group approached, and the chief was among this group. After many tense minutes of trying to prove friendliness, giving gifts of cowrie shells and steel axe heads, the leader of our party brought out a box of safety matches. The chief was amazed at this bit of magic, and delighted to find he could perform the same trick. Suddenly, he gave a loud shout. The warriors on both sides of the river raised their spears to the vertical—peaceful contact had been made—civilization had come to the Baliem!

We had known that the Baliem River would drop after the rainy season but were not prepared for it so soon. In less than two months the level of the stream had fallen too low for safe landing. We had been able to fly in necessary items for establishing a semi-permanent camp but not able to stockpile supplies for the six months dry period we knew was coming. For the next five months we prayed that the two members of our original party and the native couple would have no emergency that necessitated anyone's coming out. It just wasn't possible.

Yet they did have emergencies. Unknowingly, they had located their new camp in a section of "no man's land." Battles were fought between warring tribes right on their doorstep. Occasionally, a few natives would appear about the camp—only to be ambushed and killed by their enemies. During this period, we met the supply problem by attaching 55-gallon drums of supplies to large surplus cargo chutes and dropping them. Gasoline for running the small generators and kerosene for lamps was "free dropped" in surplus oxygen bottles, each holding about nine gallons.

It was not until November that the river again permitted a landing. During the next two months it fluctuated and never did reach a safe depth. On one occasion, after heavy rain on the preceding day, a flight was made. I had taken in several government officials a week earlier and would now bring them out one at a time. Even with the river at its highest level we could not take off safely with more than 300 pounds aboard. Now that it was low, we took off with only one passenger, although our normal complement was ten passengers and a pilot.

Usually after heavy rains when the river rises quickly large gravel bars form, and this is what happened during the sudden rise of the river from the heavy rain of the day before. While taxiing up river we noticed a number of new currents but knew this section of the river to be deep enough—unless a gravel bar had formed. About halfway to the turn-around point for take-off, we felt a shock through the hull. The engineer rushed aft and removed sections of flooring but gave the signal that all was okay. After the turnaround, the take-off was begun. I kept closer to the bank until we passed the spot where the plane had struck something. All was going well—except by now we should be on the step. A few more seconds told me we could not take off. I cut the power and threw the propellers into reverse to keep us from crashing into the bank where the river makes the sharp turn.

The engineer now called out that we were sinking. Full power to a brush-covered bank was our only chance. We climbed it far enough to remain beached there. Diving under the plane we saw the hull had ruptured at the point of the step. However, after much bailing, we checked the flow of water through the hole by stuffing waste rag into it and by using the bilge pump madly. It was our only hope. We must try to get the plane out. Should the river rise just a few feet more we would have to abandon the aircraft.

We decided to try it. Our government official lay on his stomach on the muddy floor and held the waste rag in place. The engineer stood at the rear door pumping the bilge water overboard. Taxiing up river went fine but we were less successful on the fast take-off run. Almost to the bend in the river the plane still would not go up on the step. It would be fatal to attempt the corner by differential use of the engines, due to the effects of the current. I had just decided to stop the take-off when I felt the step come into play. Now, I had more control. We entered the straight stretch and became airborne after using more than half of it. It was close, but we risked complete loss of the plane, had we left it beached on the bank of that fickle river.

Soon after this, my family and I departed for the States for a brief furlough. My co-worker returned to Hollandia the day we left. Shortly, we received word that he had been killed when the Short Sealand crashed into the mountains guarding the Baliem Valley.

It was now necessary to re-establish a supply route to our mission stations in the Baliem and in other highland parts of New Guinea. At the time, there was no airstrip in the highland interior. We decided to build strips. A new Cessna 180 was purchased and shipped immediately to Hollandia. The missionaries in the Valley scratched out a 1,200 foot runway with a 10- to 20-degree slope up the side of a mountain. A Piper Pacer landed there to re-establish contact. Within five months from the news of the Sealand crash our new Cessna also landed in the Baliem.

During the two years since the first Baliem strip was opened, more than 15 strips have been completed throughout the highlands. All were built by the missionaries with whatever native help they could get.

There is always an unexpected thrill in making the first landing on some newly completed strip. During the building, hundreds of natives will work for months digging with sticks—carrying dirt by handfuls, never realizing what they are doing. Finally, the day for the first landing and the natives gather to watch with awe the great bird that carries people inside. After one such landing, hundreds of warriors surround the plane, their long spears extended high above it. As their bravery increased, they approached closer until their long spears made an outline of the plane in such the same manner as the knife thrower outlines his subject. The occasion for all the warriors to be present was that a great battle was in progress and our first landing had interrupted it. Time was called while they inspected the plane. One warrior who had just been killed lay a few feet off the end of the strip.

Native wars sometimes follow such a pattern, in that one tribe will notify his enemy that "tomorrow at such a time" the battle will begin. At the appointed time, the combatants approach to within a few hundred feet, but instead of shooting arrows directly, they dance in circles launching their arrows high into the air to fall among the enemy. After the battle has raged for a time, a halt will be called. The women, who meantime hide along the sidelines, rush out between the fighting groups and collect the arrows which have fallen short. After this the battle resumes. At dusk each side returns home. If a casualty occurs, the battle will

(Continued on page 54)

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Bendix AVIATION CORPORATION

(Continued from page 52)

continue until the score on both sides is the same.

But not all wars are so "civilized." Blitzing warriors often sack a village impaling victims by ramming their long spears through the grass houses and burning the whole community. It is not unusual to see several villages burning simultaneously.

From the air, villages appear like huge mushroom patches. At ground level one enters a house on hands and knees through a narrow slit in the wall. The round houses are usually for the men while the women and pigs live together in low long houses. Once inside, the eye becomes accustomed to the semi-darkness and one notices the low ceiling just a few inches overhead as he squats before a smoldering fire. Above the ceiling are the sleeping quarters, well-heated during cold nights by the fire underneath. Walls and ceiling are coated with a sticky black soot from untold years of roasting pig over wood coals. Breathing is difficult for a stranger. Pork fat is the choice cut and is given an honored guest. An average village will house from 200 to 500 people, and almost as many highly prized pigs. Wealth is determined by the number of pigs and wives a native has. The pigs are for prestige; the wives for working.

Flight strips vary in nature. Some have been hacked out of rocky slopes, others dug out by removing as much as four feet of soft peat to reach a solid clay base. Still others are made by covering a peat base with a layer of clay a foot thick. The clay bakes like cement in the hot sun. On such a strip we had our first accident. Over a year of hard labor by a missionary and a few natives carved this strip on the edge of a cliff. The approach end to it was over a 1,500-foot ravine about two miles across. The strip began abruptly at the edge of the ravine and extended 1,200 feet to the wall of the mountain. Because of the deep bed of peat, where a six foot stick could be pushed down out of sight, it was necessary to carry, by hand, good clay to cover the top a foot thick. Finally, the strip was ready for the first landing. I made a few circles to reconnoiter it while talking to the missionary below by radio. My only passenger, the Director of Civil Aviation in New Guinea, and I tightened our belts, snugged our shoulder harnesses and radioed we were ready to land. Being low on the approach, yet 1,500 feet above the torrential river below, made the face of that mountain look much closer than the 1,200 feet it was. We touched down and rolled 800 feet over the hard clay surface. It looked as though we had made it when all of a sudden we were on our back. What caused it? Two deep ruts about 20 feet long showed us the answer. The layer of clay topping was made thinner at this point because the soil felt solid enough without it.

The natives, having never seen a plane before, appeared surprised when we told them this was not a normal landing. With their help, we righted the aircraft and

(Continued on page 56)

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Traveling via the route indicated on the map, Vogler overcame adverse weather conditions on much of the route. Flight details are: Distance —12,000 miles; total flight time—80 hours and 29 minutes; 16 landings, including 3 night landings; fuel consumption—633 USG for an average of 19 miles per gallon, and 6 quarts of oil. "Plane and engine perfect, easy for instrument flying, comfortable for longest distances, excellent performance, equipment worked perfectly." This was the way Henry Vogler, the 6' 4", 235 pound pilot, summed up his flight.

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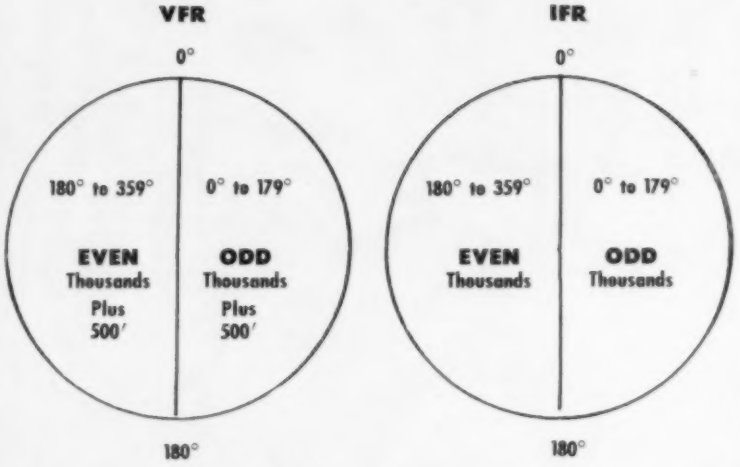
NEW CRUISING ALTITUDE RULE

(Effective August 15)



AFFECTING all aircraft flying from 3,000′ to 29,000′ above terrain, the CAB's new rule achieves a single, simplified system of required cruising altitude, based upon direction of flight. It applies to all airspace, on or off airways, over the U. S. and its territories. Requirements are:

1. All visual rule flights (VFR) heading between 0 and 179 degrees must cruise at odd thousands plus 500 feet.
2. All VFR flights heading between 180 and 359 degrees must cruise at even thousands plus 500 feet.
3. All instrument rule flights (IFR) heading between 0 and 179 degrees must cruise at odd thousands.
4. All IFR flights between 180 and 359 degrees must cruise at even thousands.

From terrain to 3,000′, it would seem to be every man for himself—so keep your eyes peeled. Keep them peeled anyway!

In addition the CAB Bureau of Safety has asked for public comment by August 11 on its recommendation that pilots be required to use standard atmospheric pressure in setting altimeters for operations above 24,000 feet. With a standard setting, without reference to local atmospheric pressure, every pilot flying in the high altitude, high speed Continental Control area above 24,000 feet would know that other pilots in his vicinity are maintaining altitudes by using altimeters set as his is set.

(Continued from page 54)

surveyed the damage. We were isolated many days' trek from our nearest mission post where we had a Beaver float plane that could fly us the remaining 300 miles to where we could get new parts and tools. We decided to concentrate on perfecting the strip.

After months of work on it, a Piper Pacer landed. Our engineer surveyed the damage and recommended a plan for temporary repairs. Following weeks of labor and pleading with officialdom, I was given permission to fly the cripple 500 miles over the mountains to Hollandia for rebuilding.

Soon we received word that our second new Cessna had reached Sydney. Our engineer and second pilot assembled the plane there and flew it to Hollandia. Within a week I returned to the headquarters post to which I had walked after the accident, this time with the new plane. We use a small strip, Oband, on the edge of the largest of three lakes high in the mountains known as the Wissel Lakes. On the flight from Hollandia to Wissel Lakes, a distance of 600 miles, I landed at Obano, discharged my passenger and supplies and flew 30 minutes more to our sub-base at Nabire, on the coast. The sub-base is located at a reclaimed wartime airstrip built by the Japanese. Although it is only a short hop from the Wissel Lakes, it is still hundreds of miles from the nearest port at Biak where the larger ships dock. From Biak the supplies for the Wissel Lakes travel by small coastal boats to Nabire where they are transferred at seat to outrigger canoes which sometimes do and often do not reach shore with cargo intact through the heavy breakers.

Events that followed brought loss of our second Cessna. The day after reaching Nabire, I had difficulty back tracking to Wissel Lakes. Weather was bad. The Lakes are a mile above sea level and surrounded by 14,000-foot peaks. Just east of them is the famous Cartenz Range, where snow is visible the year round, although the equator is but a couple of degrees north. Finally, by hugging the edges of the mountains in the heavy rain, we reached the Obano strip where

(Continued on page 58)

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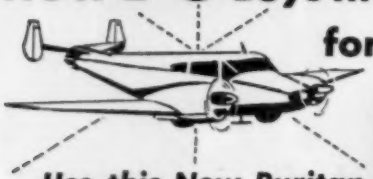

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(Continued from page 56)

we had planned a dedication service for the new Cessna. Now we waited until the missionaries arrived from the headquarters station of Enarotali, 12 miles across the lake. Heavy rains came just at the end of the dedication service and we took refuge in the newly completed school for natives near the runway. After the rain eased some of us left by boat for Enarotali.

The following day, Sunday, we received word that introduced subsequent weeks of danger and tension. Signals, flashed by mirrors from across the lake, were seen by our natives on Enarotali. In the direction of the Obano strip we observed heavy smoke that could only mean houses burning. What about the plane? We quickly notified the local chief of native police and seven of us started across the lake in a police outboard. Heavy wind kicked waves up to four feet and we were almost swamped each time we drove into one. About seven miles from Enarotali we approached a small island and decided to stop for a better look at Obano five miles away. From a high point on the island we could see that most of the houses had been burned and also see the plane still on the airstrip but could not tell about damage.

Should we continue on to Obano unarmed or return to Enarotali? From our high lookout we noted native boats gathering along a point of land we must pass to reach Obano. It seemed foolish to expose our defenseless party to a mass attack. Returning to Enarotali we overtook a party of natives in a dugout canoe. They were covered with mud from head to foot—the sign of war. From them we learned that a number of the missionaries had been killed. These few natives were from Enarotali and had hid in the grass and escaped.

At 5 p.m. two boat loads of police and the local government Controller left Obano, a one-and-a-half hour trip over the rough lake. Mr. Troutman, our mission head at the Lakes, and I followed in a mission boat. The police reached the opposite side of the lake ten minutes ahead of us, and had already started up the 20-minute long trail to the airstrip and mission station. It was dark as we edged our boat up a small stream for about ten minutes to reach the lower end of the trail. When we stopped the outboard motor there, we could hear the enemy dancing their victory ceremony on the mountain close by. Our position at the end of the trail was dangerous. The tall grass overhung both the stream and the trail. We were unarmed. Our long native-type boat was pointed the wrong way in the narrow stream. It would be futile to proceed up the trail in hope of contacting the police in the dark.

We turned our boat around and quietly slipped down stream to the lake. From here we could hear the shouts of the enemy as they taunted the police party. Then it began to rain torrentially as it can only in those mountains. We could be of no possible help so decided to return to Enarotali. Plowing back through

(Continued on page 60)

WHISTLE STOP

"Whistle stop" tuning is one of the greatest innovations to hit the low-cost aircraft radio market. It was first introduced by Narco in the Simplexer VHF transceiver, and has since been incorporated in the Omnigator Mk II and the Narco VTA-3, 27-channel transmitter. Some other radio manufacturers have adopted the system, too.

"Whistle stop" tuning gives you positive, crystal-calibrated tuning to the frequency you wish to receive on. It saves all the problems of asking for a short count or fiddling back and forth with the tuning dial until you get the tower. With "whistle stop" tuning you can set up Simplex communications almost as easily as if you had a crystal-controlled receiver.

Here's how it works. Let's say the tower talks on 119.5 megacycles. You set your transmitter on 119.5, then activate the "whistle stop" function. On the Omnigator you turn the function knob to CAL. On the Simplexer and VTA-3, you pull out a button. This makes your transmitter put out a short-range signal on 119.5 mc which can be picked up by your receiver.

Then all you do is turn your tuning dial until you hear a loud hum or whistle. Tune it to maximum tone and you know your receiver is precisely tuned to 119.5. Then push the whistle stop button in or turn the Omnigator knob from CAL to COMM or VOR and you're in business.

Needless to say, this saves a lot of time and trouble when you're switching from one communications channel to another, such as from tower to ground control. It's a great invention.

There are a few tricks you can do with "whistle stop" tuning, if your airplane is equipped with several transmitters or receivers. For instance, any VHF receiver can be "whistle stop" tuned to any transmitter in the airplane, even if the two radios are across the cockpit from each other. For instance, if you have an auxiliary VHF receiver, you can set it up on ground control prior to entering the traffic pattern, then leave it on stand-by until ready to use.

If you haven't had a chance to fly with "whistle stop" tuning, you'll get quite a kick out of the added ease and simplicity which it gives you.

Happy megacycles,

Nancy

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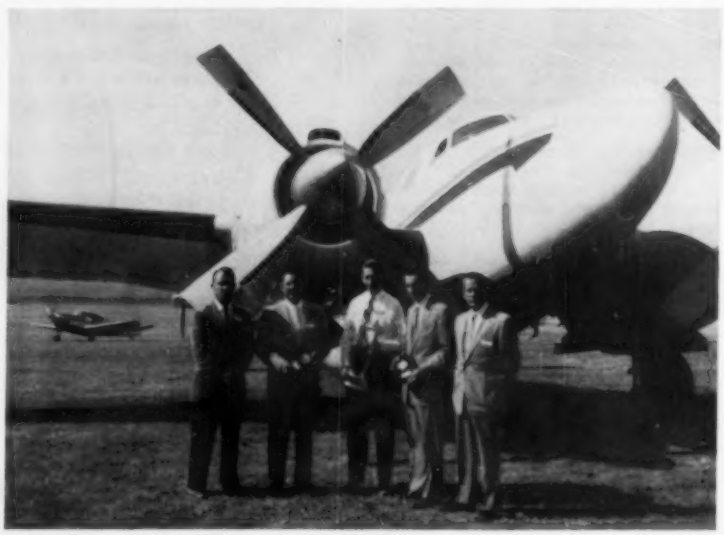
(Continued from page 58)

the waves and downpour of that pitch black night, we had to pass the point of land where earlier we had watched native boats gathering. They could easily be upon us before we could see them and, of course, could hear our outboard motor. Just as we approached this spot, we saw three flares fired by the police at Obano. Was it a signal to us? None had been arranged. What did the signals mean? After a few minutes of prayer and thought, we decided to continue to Enarotali since we were unarmed, and the police had enough room in their boats for any possible wounded. We could easily be ambushed at will by the enemy —even at our present position. We reached Enarotali cold and wet an hour later. It was not until after midnight that we knew we had made the right decision. The flares had been set off by the police as a signal that they were being flanked by the enemy and for each one to retreat to the boats. For three hours they crawled back through the swamps and razor sharp high grass to escape. One policeman had been wounded by an arrow and all were deeply scratched and cut over hands and face from the grass. The police confirmed nine dead and the destruction of the mission station and plane.

The massacre was a great shock. Later that night, after the missionaries were told to move into one house, we recalled recent rumors we had heard. The natives were blaming the whites for the increasing mortality of their pigs. There was an epidemic which government was fighting, but the poor natives couldn't understand.

Monday morning we learned the attack was to have been made on Saturday, the day we dedicated the plane. Because of the heavy rain it had been delayed. We at Enarotali had escaped death by that circumstance. Yet had we? The local police force mustered 20 men and early Monday morning crossed the lake to Obano, but were unable to establish a footing. During the day we were warned that Enarotali was to be attacked at ten o'clock next morning. All mission and government personnel moved into four houses that stood close together and could be defended best. The natives of Enarotali were assembled and the chiefs passed out white bandages to be worn as head and arm bands to identify them from the enemy. After a tense night, we had expected some word from our lookout stations. Soon, however, we learned that it was not only the natives from Obano we were fighting, but great bands of natives in every direction around Enarotali. The warriors from Obano had enlisted allies. Immediately after the attack at Obano, runners had set out with the severed hands of the head missionary teacher. At each village the runner offered the hands and, if they were accepted, that village was an ally. This continued until Tuesday morning when almost all natives within 20 miles of Enarotali were ready to fight. Our position was serious. The local natives were very much frightened.

(Continued on page 62)



WINNING TEAM

IN FRONT of the Flagship of U. S. Business Fleet, the winning crews of the two Super Ventura's owned by National Distillers and Chemical Corp., display the trophies awarded them during this year's Maintenance and Operations Meeting sponsored by Reading Aviation Service, Reading, Pa., held on June 6th and 7th. From left to right: Moring P. Clark, Jr., pilot of Super Ventura N100P, judged best equipped and instrumented; Fred Hayunga, chief mechanic; Harold Curtis, chief pilot, who flew the Flagship N200P; Donald Mosher and Thomas Vinson, co-pilots.

PLANE FAX

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Peter Gluckmann, San Francisco's Flying Jeweler, is used to accomplishing the impossible with his 225 h.p. Beechcraft Bonanza. And, this Spring, the "impossible" was his daring solo flight over the north polar cap in a single-engine light plane — a world record!

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The polar flight, from Iceland to Goose Bay, Labrador, was a 1,650-mile leg of a 25,000-mile flight through South America, Africa, Europe and back to San Francisco. Mr. Gluckmann also set another record — his was the first solo flight eastward across the South Atlantic, from Recife, Brazil to Dakar, French West Africa.

TIP OF THE MONTH

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(Continued from page 60)

At one time we decided to evacuate all women and children but learned that the locals would take this as a sign of expected defeat and probably be concerned only in joining the side that appeared to be winning. The women of the mission decided to remain. Enarotali was ringed with thousands of warriors who could attack from every side.

We were in hourly radio contact with our Hollandia base, and the government station had also made contact with the outside. Although government promised additional police, outsiders did not quite grasp the seriousness of the situation. I saw that already the mountain sides were covered with hundreds of enemy groups and reported this to Hollandia at ten a.m. We watched enemy forces grow in strength and gradually work down toward the valley between their mountain and our ridge. We had six native police, plus 300 to 400 natives to protect Enarotali. The balance of the police had sortied to Obano earlier in the morning. At 9:50 a.m. the local force completed their "waitai-ing" (war dancing) and moved out in tight groups to meet the enemy horde. I was in the radio room waiting for the transmitter to warm up when I heard the first war cries. Because the local natives had engaged the enemy in the open ground between the ridges, the police had to concentrate their fire to the opposite mountain slope. I reported the battle action by radio to Hollandia, until my battery ran down. Hollandia base was much concerned when I failed to call again on the hour. They presumed the station had fallen.

The battle in the valley was long and bitter but the enemy did not break through and finally withdrew. The firing of the guns had confused them. This was the first time guns had been used in a war with the natives. Actually there were few gunshot casualties, since the police could fire only against those on the mountain. During the afternoon, a Dutch Navy Mariner flying boat arrived with 16 policemen and supplies. Supplies were important since every bit of food had to be flown to the Lakes.

Tuesday night was another tense time of standing watch. At earliest dawn we could hear the war cries in the hills and expected another attack but, by sunup, two more planes arrived with police and supplies. Before each of the planes landed, they flew over the gathered enemy, firing warning machine guns. This discouraged the rebels and gradually the mountain sides cleared. Later in the day the reinforced police gained a foothold on the shore at Obano. Thursday I received permission to proceed to Obano to confirm the loss of mission property and plane, and to identify the dead. It had been five days since the first attack, but the enemy had been so entrenched there that it had been impossible for the police to retrieve the slain.

Another missionary, Mr. Catto, and I, accompanied by a Police Captain and seven troopers, set out for Obano. At the advance post on the edge of the Lake, seven more men joined us—including the

(Continued on page 64)

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(Continued from page 62)

Chief of police. The six officers had Sten machine guns, the rest carried carbines. Mr. Catto and I packed shotguns by order of the police, since it is a mission policy not to carry a gun. Behind us, from a ten-foot high platform, a policeman kept a Bren gun firing over our heads as we moved slowly down the trail. From the mountains we could hear the enemy calling out our names as we went along. The officers kept firing their machine guns into the tall grass on either side and ahead as we advanced. Sometimes we could see up the trail a few hundred feet and note the enemy darting off to either side into the tall grass. The trail led straight to the mission station but paralleled the airstrip at a distance of about half a mile. Ahead, where the mission station had stood, we could hear the enemy "waitais" (war dances). We did not want to risk a mass attack and since the airstrip was parallel to us at this point we decided to cross through the deep grass to it. We proceeded thus cautiously and slowly with the police firing continuously. Finally we reached the very lower end of the strip. At the opposite end, the natives were still hammering and banging on the plane. A few shots sent them scattering to cover.

We had begun to pick up instruments from the plane hundreds of feet away.

(Continued on page 66)

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(Continued from page 64)

Parts of the cowling, tail, doors and fuselage were scattered everywhere. The interior was completely gutted and the beautiful red material from the interior would now be used for headdresses of many warriors. While the police guarded me, I took some pictures. They decided it would not be possible to enter the mission area without reinforcements so we started back down the strip. Before we reached the lower end we could hear the natives once more hammering and chopping on the plane. Our return through the deep grass to the trail was even more ticklish. As we crept along, insulting cries from the mountains called out the names of their next victims. While we had been gone from the advance post, it had been attacked from two sides and one policeman had been wounded by an arrow. It was late afternoon and raining when we started back to Enarotali.

By Saturday, three plane loads of Marines had arrived. Although modern firearms were an advantage, the government preferred not to use them as a direct means of fighting. The greatest losses suffered by the rebels were at the hands of the Enarotali natives. While the guns kept the enemy in the mountains, our native allies went out and burned houses, slaughtered pigs and dug up sweet potatoes from rebel gardens. The sweet potato is the staff of life to the natives. After a month of this raiding, the battle began to turn in favor of the government. A large group of natives from one of the sister lakes joined the government and, from their position behind the Obano group, drove the enemy out of the hills into the hands of the Marines. Although the fighting was over, the tension long has remained due to the fact that since native wars are considered won by the side inflicting the heaviest death toll, the natives from Obano still consider themselves the victors.

At first opportunity I returned to Hollandia. We were temporarily without an aircraft, so I contracted to fly a KLM Beaver for the government under an agreement whereby the mission should receive the same amount of flying hours free as I flew for the government. With this agreement we were able to keep the supply lines open to the Baliem and to the Wissel Lakes.

There is a deep excitement in seeing missionary stations grow in the interior where for endless centuries there was nothing. These stations are gateways to human minds long imprisoned in superstition and ignorance such as prompted the massacre at Obano. And none of them could be established in the highlands without the airstrips and the little airplanes. Sometimes I sit down and ponder about the grueling work and hazards involved. The price seems high for what we accomplish. What then really drives an old airman to stay at it? I'll tell you. I just can't bear for any human being not to have a crack at the kind of satisfaction I've had in feeling God cared about a pilot named E. W. Ulrich. Flying for His kingdom in my book is the world's best job. END

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OX-5 Holiday

(Continued from page 43)

their bag of tricks—snap rolls, loops, spins, dives and zooms. Then, when the stunt men turned back toward the cow-pasture airport, the crowd stood by, waiting for Bartow to return with the ship from which Bill Cramer, Parker's younger brother, was to make a parachute jump. But back at the airport, Cramer and Bartow found no Bill. He had failed to return from Pittsburgh where he had gone to borrow a chute. An hour passed and word was phoned to the flyers that the crowd was becoming impatient. Something had to be done. Shorty snatched up a suit of coveralls, stuffed them with dried cornstalks from a nearby field, and threw the dummy into the OX-5 Standard.

With Bartow at the controls, the plane took off, flew down Main Street at low altitude and then, as the crowd cheered, Red set the nose for maximum climb to 2,000 feet. Over the intersection of Fifth Avenue and Main Street, Shorty eventually pushed the dummy overboard. A breeze began to drift it toward the river. When the crowd noted that no parachute opened, it took off running across town and down the hill to the river valley to view the gory remains of young Bill Parker. By the time the hoax was discovered, and a committee arrived at the airport, both Cramer and Bartow were well out of reach and planning their program for the next day.

The second extravaganza attracted an even bigger crowd because the first day's practical joke had hit the front pages of out of town dailies. For this occasion, shopping hours having ended at 3:00 p.m., the crowd assembled along the river bank to witness Cramer and Bartow stage a second stunt show to be climaxed with Bartow flying under the low bridge. Everything went off as scheduled, including a real parachute jump and then Bartow came barrelling down the canyon, headed for the bridge. He made it under the bridge all right, with inches to spare between the prop tips and the bridge structure but the plane's wheels slapped the water and killed a lot of flying speed. To make it more interesting, the downdrafts from the hills kept the plane from gaining altitude for several miles and Bartow had to zig zag between the river banks. Everyone, including the merchants, was happy and looked forward with glee to the big finale.

The Saturday feature was held up until the merchants were sure the shoppers had all been satiated. Then a messenger was sent to tell Bartow all was in readiness for his projected take off from Main Street. A half hour later, Ken Keefer, at the wheel of his Model-T towed the Tommy Morse Scout down the main drag so filled with people that progress was impeded. To build up suspense, Bartow would stop frequently and check his tail-heavy pursuit plane while hundreds of curiosity seekers peered over his shoulder and tried to get into the act. Then, while the local constabulary, aided by volunteers and firemen, held back the crowd, the plane was moved to the corner of Sixth Avenue and Main Street and headed down Main which was only ten feet wider than the plane's wingspread. Each side of the street was crowded with holiday seekers any of which could extend a hand and touch the oft-shattered wingtips.

Finally, Bartow donned helmet and

(Continued on page 70)

WHERE AM I?

Aerial views like this are familiar sights to American airmen—but what is this and where is it? Is it an air base, a housing development, a resort community?

(Answer on page 83)

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(Continued from page 68)

goggles, climbed into the cockpit, and gave the signal for Cramer to put chocks in front of the wheels and swing the prop. We could see Bartow squint down that narrow street, trees and populace filling its sidewalks at either side, and a line of low telephone wires crossing the street just about where the plane would break ground. On the right side of the street at that point was a long flat board fence enclosing the backyard of a hotel. Above the fence, rows of hotel laundry hung drying on the wash lines. An apple tree in the hotel yard was filled with youngsters who wanted a birds-eye view of the proceedings. The whole take-off distance was only a city block long and at the end of the block was the hardest graystone Methodist church ever erected by man. In front of the church was an unusual assortment of tall trees and telephone wires. Just how Red ever expected to fly out of that tanglefoot setup, he never later explained. He was concerned only with the $300 and the feed bill.

Finally with a wave of his hand, Bartow signalled the crowd to move back. Ken Keefer and Al Haines pulled the chocks. Forward went the throttle, the TM moved slowly at first and then the tail came up as the crowd filled in behind the moving plane and was dusted by its slipstream. To this day, even Bartow doesn't know how he managed to miss spectators who crowded the curb for things started to happen when the plane reached the first alley intersection. A hard crosswind down the alley slapped the craft broadside and swung it in a groundloop. It leaped the right curbing, over scores of men, women and children, crashed through the big board fence and banged headlong into the trunk of the apple tree, jarring down a shower of urchins from the branches. The broken clothesline shed its assortment of sheets and blankets quietly over the wreckage from which Bartow soon emerged like a beetle from a snowdrift. One of the few townspeople who owned a camera at the time, snapped pictures which still adorn Red's scrapbook.

Never before or since was more excitement crowded into three days. Fun was had by all and no broken bones. There was some hassle however about the distribution of the $300. First was the board bill. That took a healthy bite out of the Cramer and Bartow assets. Then came settlement for a rewash of the laundry and damages for the apple tree. But things might have been worse. True the plane was a washout but there was enough cash to pay the restaurant and establish credit for another winter. And, of course, when you have credit you really don't need an extra airplane. END

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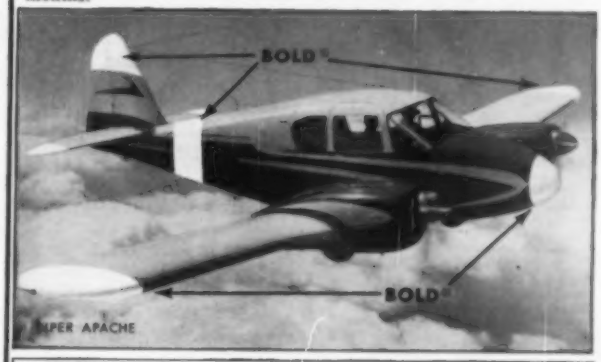

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By BOB MAYS

My job is flying and demonstrating the LEAR L-5/LIFE equipment. This, you will say makes me prejudiced. To this, I agree, because day after day I see many people, including all types of pilots, engineers, etc., who "wring-out" this equipment and come up with nothing but praise.

On my "check-out" flight in a twin aircraft I'd never flown before, using LIFE I'd never seen before, I completed two of the best ILS approaches I've ever made. Next, I made an automatic approach with the L-5 autopilot which was even smoother than the one I had done manually. I especially liked being able to monitor the entire approach on LIFE while the L-5 autopilot did the job.

The L-5/LIFE combination is a great relief to me, especially when I'm flying as a one-man crew. I am free to monitor engine instruments, navigate, communicate, and best of all in this day of heavy traffic density, watch out for other aircraft—greatly decreasing the chance of collision.

The NAFLI ATTITUDE/COMMAND INDICATOR gives me a clear and *natural* presentation of my aircraft's attitude at all times. And in ILS approaches I simply follow its *command* signals for smooth, precise interception of the localizer and glide slope.

The SITUATION DISPLAY INDICATOR pictures my position in relation to the localizer beam, VOR radial or selected track—in the meantime, the L-5 holds my assigned altitude and flies the heading or track I have chosen.

To fly an airway, I merely push two buttons, and I automatically maintain my desired altitude and track. Even my *wind correction* is figured automatically and compensated for me. And the SITUATION INDICATOR shows me my exact crab angle due to cross-wind.

I often fly long hours, and the L-5/LIFE combination allows me to arrive at my destination far less fatigued and therefore mentally alert to approach and land, which is vitally important.

Because of L-5/LIFE's simplicity and reliability, I have lowered my personal minimums considerably—it has taken all the sweat out of low visibility ILS approaches.

Holding patterns, weather and clearances are no longer a three-man job. I receive and transmit clearances while flying a holding pattern by merely turning a knob or pushing a button.

All kinds of people have flown "LIFE"—a 15,000 hour airline captain—private pilots, both IFR and VFR—and their praise was unanimous.

In conclusion, this L-5/LIFE combination is not only wonderful to fly, but a real thrill to demonstrate. As the French say, "C'est la vie"... THIS IS "LIFE"!*

Bob Mays

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Mother Lode in the Bay Area

(Continued from page 29)

He can relax while cutting down the San Joaquin Valley to visit a rancher client or curving over to Tahoe and Reno.

In the Aircraft Maintenance section supervised by Cap'n Leon Cook, the shop is equipped for aircraft engine overhaul, airframe rebuilding, aircraft painting, maintenance and inspection, as well as radio and instrument work. Cook's qualifications read like Winston Churchill's medals. They go from the time of the Spad to current turbos, and the captain is one of the few A&Es on the West Coast with a jet engine rating. One of his innovations for the purpose of better utilization of aircraft was to buy two standby engines. When an aircraft comes into the overhaul shop, the engines are exchanged, and the plane is back on the flight line in a few hours instead of several days. As to how well a good engine overhaul program can contribute to a fixed base operation—this is what he says, "We magnaflux all the steel parts but we replace all worn components, even before they reach conventional tolerances. Labor costs are so high that it's wasteful to put a worn part back in operation just because it's still 2000ths above limits. We replace any part that even smells worn, and, in the long haul, our way saves money."

When the taxiways at San Carlos were gravel, "Cookie" developed a pant for the nosewheel to prevent pitting of the props. Many of his discoveries have ended up as manufacturer's bulletins to aircraft owners. When the content of aviation gas varied a few years ago, he came up with a plug gap setting which became standard. He found cracks in the jugs of a particular new engine at almost every checkup through his thorough methods. The manufacturer was notified. It was the first report they had received and soon a bulletin came out on the item. Engines delivered thereafter had a heavier jug. It was testimony that field inspection is an engine manufacturer's strongest ally.

The unusual philosophy at Harper Aviation of spending more money to save much money is proving out. The cost of each engine overhaul is a fraction more, but the extended time between overhauls makes for exceptional utilization. Similarly, the hourly rate for Harper's student program is somewhat more expensive than at many airports, but the student can get his private certificate in 40 hours instead of 54; and he will have learned controlled-airport flying—an essential today. That pinpoints Hap's idea of the way a student program should be run—quality—not mere quantity. It has attracted one of the biggest student flying enrollments on the West Coast!

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takes off on a local recon flight. In the early morning he calls Don at KSFO over an Air-Marine VHF telephone and broadcasts directly about latest weather and traffic conditions. At noon and teatime Hap makes an aerial survey of how-go-zit over the Bay area and calls the information into the radio station. As a result, Hap Harper's name has become a byword to early morning listeners around the Golden Gate. Sherwood addresses him as, "Oh, Great White Eagle in the Sky!"

Don and Hap have rigged up a treasure hunt which is now in action. More than $5,000 worth of prizes are stashed away, making San Carlos airport a Bagdad-By-The-Bayshore. They have an expedition planned into the land of the Navaho Indians to inspect living conditions, which have been reported as at a low level. There is cause for mock alarm, since they will invade the reservation in an Apache!

After that Don and Hap will launch themselves in a floatplane from the shores of Sausalito in an attempt to float to San Francisco, across the Bay. This will happen on a day when the tide should carry them to Oakland, and will prove, Kon Tiki style, that Oaklandites are people who tried to get to San Francisco and couldn't make it! This fall, Hap will sponsor a TV show on KPIX. It will be titled, "How To Fly or The Life of a Private Pilot!" It will be a weekly half-hour program.

Harper has built a fixed-base operation with aggressive sales promotion reminiscent of the spirit that drew the attention of the world to the West Coast in the first place and in so doing, has created a Gold Rush of his own. But above all, he is giving solid value to the pilots of tomorrow now passing through his hands. END

Tornado

(Continued from page 48)

type cloud—dark with a roll effect on the bottom. The funnel more or less pointed right out of the cloud.

Q. Were there any other circulations in the vicinity of the tornado?

A. You could see the positive circulation at the base of the clouds. It became occasionally streaked but you could see the rolling and twisting of the cloud which you couldn't see from a distance; just up close.

Q. Flying at 200 feet, did any debris come up to your flight altitude?

A. At 200 feet I wasn't close enough. From where I was sitting everything seemed to fall out on the northeast side.

Q. How high would you estimate the debris was being carried?

A. About 300 feet. It picked the roof off the house completely intact and, as it went around in the circle, I'd lose sight of it; it would come back on my side and I'd see it again. It went around four times, then was spit out intact on the northeast side about an eighth of a mile from the house where it landed

(Continued on page 74)

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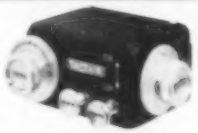

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(Continued from page 73)

in a field. It couldn't have started in the core of it and gone on up. The core of the storm didn't hit the house; it was the west side of the core that hit it and it never did get out of the whirl. Had it been directly in the center it probably would have gone a lot higher.

Q. While the tornado was touching the ground, did you notice it describing any circles on the ground or anything like that?

A. No. It looked more or less straight. I didn't concentrate on it but you could see the streak in the mud. It was extremely muddy—had been raining a lot.

Q. Can you think of anything we haven't asked you?

A. No. I don't think of anything that I haven't told you. It's just like experience in anything else. We probably would get ten times more information on following another one. I'm not as afraid to get so close as I was because I've had a chance to reason out the effect on the aircraft. I've flown in toward the center of hurricanes and after two or three of those flights we learned enough to feel completely confident—know which side to go in and how to tack in and out. On a tornado it would be the same on a lot smaller scale, except you don't dare get into the core.

Q. Did you see any other formations that looked like another funnel trying to form?

A. Oh, yes. We saw several but they never did materialize or get on down to the ground.

Q. These other little funnels you saw —how far down would they stick below the clouds?

A. Oh, they didn't get down very far. I'd say 100 feet below the base of the cloud.

Q. How close to the main tornado were these?

A. The one to the east was three or four miles from the main tornado. On the west side five or six funnels formed and held for just a short time.

Q. Are you sure they were funnels; could you see the circulation in them?

A. Oh, yes. You could see the circulation of visible moisture.

Q. I just wanted to be sure it wasn't a ragged cloud you were looking at.

A. No. It would definitely form. But they were just fragments out of the same cloud that produced the full-fledged one.

Q. They were all definitely counter-clockwise?

A. Yes. Quite visible; quite plain.

Q. Did you notice any hail falling on the ground?

A. No. I don't think there was any hail. I observed the top of the cloud from a backward position. I don't know how high it went but it wasn't too high. Of course, there was an overcast above that.

Q. Would you care to estimate the height of the top of the cloud?

A. I'd say 3,000 maximum, above sea level. I don't think there was more than 1,800 feet thickness in the cloud that produced the big tornado.

Q. What kind of cloud would you de-

scribe it as being?

A. It would be hard to classify. It definitely wasn't a cumulus cloud at first. It was an extremely dark cloud of strata-appearing formation.

Q. Did you notice as you would approach and recede from the funnel whether there was an air temperature change?

A. I didn't notice the air temperature change.

Q. Would you estimate the width of the funnel near the cloud base?

A. At the cloud base it was rather wide. I'd guess it varied from 600 to 1,500 feet. While on the ground it was on the order of 200 feet or less. It looked like about 60 feet at times. At other times it was maybe 300 feet.

Q. When the funnel got narrow at the ground, would it tend to lift off the ground?

A. No. It seemed to stick like a magnet once it hit, but it would hunt around on the ground.

Q. Did it hug more when it was smaller?

A. Yes. The smaller it was the more it sort of snapped.

Q. Did it seem to try to follow the relief of the ground, topographic features, or not?

A. Well, I don't know but it got onto a little farm road of white rock gravel and went right straight up the road about a quarter of a mile. That road was the only thing it seemed to stay on.

Q. Did it cross over streams, valleys, etc?

A. There weren't any hills, but it crossed streams, little creeks and went right across flat land, crossed the highway and it wasn't parallel with anything except for the quarter-mile stretch on the white rock road. That was directly north and south and as soon as it passed the house it moved slightly to the west.

Q. Do you have any idea what time it was during this?

A. Somewhere between four and five o'clock. Before it dissipated, it picked up in speed considerably over the ground. It slowed down and at times was moving maybe 10 miles per hour. At others times it got up to 30 miles per hour.

Q. Did it have a tendency to become nearly horizontal as it dissipated?

A. Yes. As the tail went up—when it completely disappeared—the funnel pulled up about 30 or 35 degrees from horizontal.

Q. After the funnel went back into the cloud, did the circulation in the cloud slow down?

A. It didn't seem to have any particular circulation. It just engulfed it. After that there didn't seem to be much movement in the bottom of the cloud, at least no rotating movement—just changing like a cumulus cloud would change in shape. But it was not white, like a cumulus cloud; it was dark, like a nimbus cloud.

END

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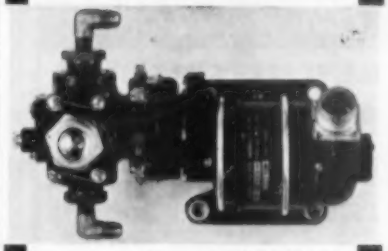

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Flashlight Lawrence

(Continued from page 33)

a self-taught pioneer picture-maker. His most notable achievement was invention of a new and practical flash powder and a powder-holder to set it off—two essentials of the professional photographer until the modern flash bulb came into use. The invention of the powder earned for the inventor the nickname of "Flashlight" Lawrence.

"Flashlight" was not satisfied with taking pictures on the ground. He wanted a bird's-eye view of people and places. He wanted up in the air. For his first aerial shots he stood at the top of a high ladder at a race track. The ladder was frighteningly shaky, anchored only with guy wires and ropes, but Lawrence got pictures of races, and later of baseball games and other sporting events. There was only one thing that troubled him. The ladder wasn't high enough.

Delving again into his creative mind he dredged out a plan for a novel tower, built in telescoping sections to make it reasonably portable. It rose to a lofty height of 216 feet and, on windy days, the photographer could feel the structure sway as he stood at the top with his cameras. After a while he was dissatisfied again. The tower wasn't high enough.

Next Lawrence rented a captive balloon, a gas-filled bag held by 1,000 feet of cable. On June 21, 1901, he stepped into the balloon basket, signaled the operator, and went floating up to get an aerial picture of the Chicago stockyards. He got closer to Heaven than he had expected. After shooting his pictures from 950 feet, he signaled to be brought down. When he was still more than 200 feet above the ground, the lines that held the basket to the balloon snapped. The basket tore away. Lawrence plummeted toward earth and what seemed like eternity, but landed across a maze of telegraph wires stretched some 40 feet above the ground. The basket bounced once or twice and fell to the road. Miraculously, Lawrence was not seriously injured, though considerably shaken by the ordeal and convinced that balloons were for balloonists and not for photographers.

One day soon afterward, while walking down a Chicago Street, Lawrence saw an advertising banner in the sky, held aloft by a big kite. He followed the kite string to its holder, a man who had built the kite to his own design. Lawrence bought the kite from him and used his own ingenuity to improve the design. The result was an arrangement of cloth prisms flanked by "wings" measuring seven feet over all. This was a new idea in kites and Lawrence called it a "captive airship." Using three or more captive airships in tandem, one above the other, he found he could anchor small cameras beneath the kites and take aerial photographs while he remained safely on the ground, controlling the shutter with a separate cord.

In 1906 "Flashlight" Lawrence made the most spectacular picture of his career, the most amazing ever till then produced. The city of San Francisco had been devastated by earthquake and fire, one of the great disasters of history. News of the debacle sent Lawrence rushing to the coast with his one-eyed all-seeing monster.

On May 29, 1906, with the great camera lashed to 17 of his captive airships with crowds of skeptical men and women watching the preparations, he launched the kites to carry his bungalow-sized picture-machine skyward. One by one the kites soared toward the clouds. When all were aloft the lines tightened, and instinctively the crowd strained as though to help lift the tremendous box upward. Slowly it moved up, swinging and swaying in the wind. Lawrence monitored the men controlling the winch from which spun the kite line, and watched anxiously as his invention seemed to grow smaller and smaller in the sky. At 1,500 feet Lawrence snapped the shutter, capturing for posterity one of the most magnificent aerial photographs of all time. The contact print, 8 feet long, 4½ feet high, showed clearly the rubble of the city—

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Nob Hill, skyscrapers, the Bay. The first aerial photographer made and sold reproductions of his picture all over the world, netting $15,000 from the prints alone.

After this feat, Lawrence specialized in aerial photography with his captive airships, making land surveys over Wyoming, Utah, and other western States, shooting proposed irrigation areas, and tackling other jobs which were impossible for his ground-bound competitors.

In 1910 he was hired to accompany a Chicago publisher, named Boyce, to Africa to photograph wild game. Lawrence accepted eagerly. The safari included nearly 30,000 pounds of captive airships, telescoping towers, and photographic paraphernalia. However, the members of the group fought among themselves until all agreed to discontinue the expedition and return home. Lawrence did, however, rig cameras in the jungles so that wild animals would photograph themselves by tripping lines to the shutters, setting off the flash powder.

When Lawrence returned to Chicago he temporarily abandoned photographic work and plunged into management improvement—it was called "efficiency engineering" then. Later he became interested in heavier-than-air flying machines, but in 1936 again opened a photographic studio with a partner—the once-young apprentice who had helped him learn how to develop a plate back in 1893. He continued in the business until his death December 15, 1938. END

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Skimmer IV Amphibian

(Continued from page 42)

the rate of climb was 1,000 feet per minute. This high rate of climb is due to the efficient NACA slotted flap. The flap has only two positions, up and down. It has a restrictor valve incorporated in the hydraulic system and can be left in down position at practically any speed without fear of spilling. It is actually a high lift rather than a drag flap, but also acts as an effective dive brake. Retracting the flap in full climb, there was scarcely any change in trim. The air speed went up to 90 mph and the rate of climb decreased to 850 feet per minute. The hydraulic trim tab was a real pleasure, just a light flip of the lever with the finger trimmed the Skimmer. Reaching 3,000 feet, the engine was throttled back to 2,400 rpm and the manifold pressure reduced to 25 inches. This gave 75 per cent power. Trimmed for level cruising at this setting, the Skimmer indicated 130 mph.

At this altitude I decided to check stability and control characteristics. Establishing a normal climb attitude and lowering flaps, I reduced power in an attempt to reach a stall. The ship just buffeted and floated, the air speed indicator reading 51 mph. Recovery was immediate upon releasing control pressure. Another try, with power on, produced a pronounced warning. With the control column full back and nose high, the Skimmer vibrated, shook and rumbled. In neither case was the aircraft completely stalled out. It reached minimum speed condition and was still flying. There was no drop through and the aileron and rudder were completely responsive.

Maneuverability of the Skimmer is excellent. The ship has a very rapid rate of roll. Exceedingly tight turns can be accomplished. In medium banked turns, practically no back pressure is required. Undoubtedly, it is a good instrument airplane. While controls feel somewhat heavy, this is not objectionable. Rather it adds to the solid feel of the craft, and is cancelled out by immediate response to control movement. A side light on Skimmer controllability, not familiar to seaplane and amphibian pilots unless they have flown aircraft of this particular configuration, are trim changes influenced by application of power. Associate Editor of FLYING, Alex Dawydoff, who accompanied me on some of the check flights, knew about this condition and was curious to check for himself how radical they were. In an airplane with power installation high above the centerline of the fuselage, there is a definite down pitch when the throttle is advanced and up pitch when power is reduced. To test these trim changes, Alex and I went up, with me handling the throttle while he manned the flight controls. The Skimmer was trimmed for normal glide, power setting at 1,600 rpm and 16 inches HG. When full power was applied, the nose assumed an increased downward angle by about five degrees and Alex had no trouble in returning to normal flight attitude. We repeated this procedure twice; one recovery was made using wheel control, the other by using trim. Reduction

of power causes the ship to nose up. This again is quite mild and can be trimmed out immediately with the quick acting trim control. The trim changes are not objectionable or dangerous in the least, but they do exist and are a natural effect in an airplane with high thrust line.

Completing the first portion of the flight check, I entered the Teterboro landing pattern, letting gear down on the downwind leg, turning onto base, lowered the flaps and slowed the Skimmer to 110 mph. Turning into final, the speed was decreased to 90 mph, with 80 showing just over the fence. A normal flare-out, and the ship settled on the runway. The moment it touched down, the airplane clung to the runway. You actually fly it down, apply back pressure and it greases on. Length of the run is extremely short. You can brake to a stop in 200 feet.

My next check flight from Teterboro was on a gusty day with wind velocity up to 25 knots. I carried two passengers, one weighing 210 pounds, the other 190, with my weight of 170 pounds, and 25 gallons of fuel. The plane got off in 500 feet and climbed at 500 fpm.

To check water characteristics, we used Greenwood Lake and the Hackensack river near my seaplane base. By this time, I had developed an affection for the Skimmer and its gentlemanly manners, but I was still in for surprises. Its behavior in the water was a revelation. One of the most difficult landing conditions is afforded by calm and glassy water. The pilot is robbed of depth perception. He either flares out too soon or too late.

Choosing a calm day, we shot glassy water landings on the Hackensack River. Using one of its shores as a reference point to judge height of approach, we crossed over the land at 750 feet and made a 90-degree turn to line up with the river. The water was leaden with haze and reflection of the afternoon sun. Reducing power and trimming the Skimmer to indicate 75 mph and descent rate of 150 feet per minute, I released my hold on all controls and let the ship glide in. It touched down in a rather flat, level attitude, slowed to a moderate speed and skimmed along without the slightest tendency to dig in or porpoise. It acted as though skilled hands were on the controls. A truly amazing performance. This is the only amphibian I have ever flown with such characteristics. Try it on any other and disaster will strike swiftly. The phenomenon here is due to the stability of the hull and its pivot point located relatively far back. It is one of the most salient features of the design and one of the most important ones from the standpoint of safety and utility.

Subsequent water tests served to prove further the phenomenal handling and stability features of the plane. On several landings, with power on, I was able to release all controls immediately upon touching down. The bow would not dig in. The hull rode straight and true. Tests on downwind landings were the same.

On take-off, the Skimmer gets on the

(Continued on page 80)

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Write for Zahns Airport Guide

(Continued from page 79)

step after a short run and breaks water in approximately 500 feet. Here also, I put it through trials which would have been very radical to previous types. During one take-off, I released all controls when she was on the step and let her run unmanned. At the last moment, I applied slight back pressure on the column and the airplane became immediately airborne, still on its original course. One of the big advantages is the high location of the engine and propeller. Spray cannot reach them and they remain at high peak efficiency during takeoff.

I did taxi turns at 45 mph without either wing digging in. This is due to the flat-bottomed tip floats which rest simultaneous on the water. They have flared triangular extensions on their sterns and act as hydroskis. The general feeling is more like that of a speedboat, though I feel safer in the Skimmer as it has no capsizing tendencies. This feature makes for safety in rough water operations. And speaking of rough water, I made several tests with wind velocity at 25 knots—one and a half foot waves. Here again, due to the planing effect of the tip floats, neither wings would lift and expose the undersurface to the wind —usually cause of capsizing.

Concluding our series of check flights over several weeks, we landed on the Hackensack River, lowered the gear and taxied up the ramp of my seaplane base. This was a test to check the efficiency of the brakes after exposure to water. Though soaked, they permitted a sharp 360-degree turn on the apron in front of my hangar.

In my judgment, the Skimmer is an excellent amphibian combining the virtue of good aerodynamic and hydrodynamic designs. It is honest to fly and has ample visibility in all directions due to the forward location of the cabin. A landplane pilot will have no difficulty checking out in a very short time because of the remarkable water handling characteristics. It can be operated from small airports and restricted water areas due to its take-off and landing ability and high rate of climb. As a veteran seaplane pilot, I feel it is an important contribution to general aviation of this country.

SKIMMER IV, Model C-2
Manufacturers' Specifications

Wing span	34 ft.
Length	23 ft. 6 in.
Height	8 ft. 10 in.
Wing area	157 sq. ft.
Wing loading	15 lbs./sq. ft.
Gross weight	2,350 lbs.
Empty weight	1,525 lbs.
Useful load	825 lbs.
Engine	Lycoming 0-360
HP and RPM	180 at 2,700 rpm
Maximum cruising speed	134 mph
Stalling speed	52 mph
Range	450 miles
Sea level climb	800 ft./min.
Optimum cruising altitude	6,000 ft.
Fuel capacity	40 gallons

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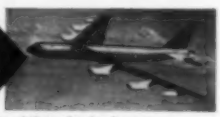

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Guidance for Space

(Continued from page 27)

as titanium have demonstrated great resistance to radiation and extreme temperature. Use of such micro components would permit fabrication of a complete radar intermediate frequency circuit on a board no larger than a fingernail!

One of the more complex problems facing the space voyager is that of knowing where he is at any given point or time. An astronomer, when asked, will avow that the calculations of his science are accurate. But when pinned down, he may admit to a margin of error—say 10,000 miles in the location of this or that planet. After all, 10,000 miles is infinitesimally small in percentage when one is figuring in millions of miles—or perhaps light years. But 10,000 miles, or even 1,000 in error could be troublesome to the space traveller trying to make a soft landing on some planet.

One attempt at solving the space orientation problem is being conducted at MIT under the SPIRE (Space Inertial Reference Equipment) program. Initially the guidance of space vehicles may be accomplished by using a combination of several techniques. For example: guidance in early stages of space travel may be from ground-based equipment. An inertial space reference system might take over in the midcourse phase. In the terminal phase the pilot may actually need to "look" directly at the target. At this point he cannot afford an error in his "soft landing" calculations. So, he may employ a combination of "sensing elements" such as radar, optical, IR or other. The sensing operation could be "passive," that is, he might be receiving only—not sending. Thus using radiation (almost any type of radiation) from his target, the pilot is enabled via his sensing elements to "see" and land on a specific point.

In all of the score of space projects in this country, whether they be in the discussion stage, on the drawing board or actually under development, almost every one has the ultimate aim of putting man up there with the machine. When the ballistic missile became a piece of actual hardware, launched successfully with all its potential, there was an interim logic which held that the day of the manned aircraft was nearly over. Today it seems apparent that the rocket engines which boost the missile into its ballistic trajectory are themselves working at an interim project which will be completed when they boost man into space for whatever job is to be done.

From the purely psychological point of view, man will not long be satisfied to send unmanned vehicles on space exploration without someone aboard to come back and tell the story. From a scientific point of view, until missiles develop judgment and reason man will not long be content to place great value on them.

Recently, Lt. General Irvine, USAF Deputy Chief of Staff for Material, told a space age conference: "Hardware performance criteria for the space age,

(Continued on page 82)

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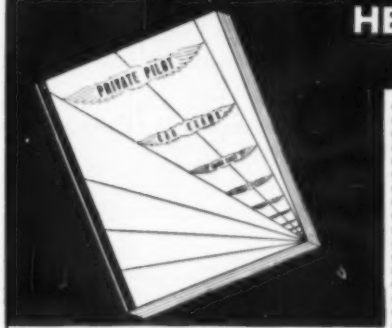

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(Continued from page 81)

though startling, represent a natural progression of current Air Force trends. Manned space vehicles with weapon development capabilities within the earth's gravitational field, may be equipped with fantastically improved space-launched weapons. Space intercept weapons may play the same type of role they play now, except that they may be deployed thousands of miles above the earth instead of thousands of feet."

He spoke of the X-15, which he said is expected to exceed an altitude of 100 miles and a speed of 3,500 mph, and continued: "A greatly improved manned space vehicle project is the DYNA-SOAR. This one will employ the boost-glide flight principle; it will be controllable from orbital altitudes down to well within the atmosphere, and it can be recovered undamaged.

"The logical outgrowth of these experiments will be operational type vehicles, which will be hypersonic and operate above the atmosphere. The time is not far distant when take-off and landings of space vehicles will be as common as airplane operations of today."

The successor of the B-70 prototype may not be called a bomber. It may have an "S" designation—"S" for Space. But it will be manned and it will handle the requirements of retaliation against aggression. END

Foundation for Air Training

(Continued from page 45)

parental attitude undoubtedly plays its part when a young man considers a career. This must influence the number of young men coming forward each year to take up flying. Gliding is a relatively safe sport. Parents can become sympathetic towards flying, not only as a sport but as a possible career.

In Holland, in 1951, an analysis was made of a complete group of pupils at an airline training school after the group had completed a 2½ year course; following are the results of the analysis:

(a) Those who withdrew during training—non-glider pilots, 16 per cent; glider pilots, nil.

(b) Admitted to advanced training—non-glider pilots, 29.7 per cent; glider pilots, 90.9 per cent.

(c) Washed-out during training—non-glider pilots, 13.3 per cent; glider-pilots, nil.

There can be no doubt in the mind of anyone seriously involved in the broadening operation of very high speed aircraft for commerce and business, or in the penetration of space for security and the advancement of science, that the subject of training must be re-examined with great care. Training must be initiated sooner, must be more comprehensive, more thorough than ever before. The potential of soaring in this respect commends itself in a fresh light. END

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S-62 Amphibious Helicopter

(Continued from page 49)

In size, the new helicopter is similar to the S-55 and uses its dynamic and mechanical components such as the main and tail rotor systems and the major portions of flight control and hydraulic units. The use of these components, well proven during more than 1,000,000 hours of operation in 1,200 S-55's manufactured during the past nine years, greatly accelerated the development of the S-62. In addition it will benefit the civilian and military operators by enabling them to utilize their supplies of S-55 parts. For S-55 owners, the manufacturers have an interesting trade-in arrangement by which they can turn in their helicopters for retrofit. Sikorsky will install the mechanical components of the turned in S-55's on S-62 airframes together with the turbine engines, providing the customers with new amphibian helicopters, at a considerable saving.

The S-62 can be powered by either a General Electric T58 gas turbine engine of 671 shp or a Lycoming T53 of similar rating. The engine installation weighs only one-third of that in the piston-engined S-55 and in combination with the boat hull design, a 700-pound increase in payload, together with 20 mph gain in speed over the S-55 is achieved. Because of its light weight, the engine can be mounted on top of the hull out of the water spray.

The use of turbine power resulted in an unequaled hovering ability of the S-62 as the engine's sea level rating is fully available at 17,000 feet. Without ground effect, the helicopter can hover at 8,000 feet.

The roomy 14-foot long cabin can hold eight to 12 passengers. Alternate cargo capacity, with all seats removed, is 440 cubic feet. Top speed is 117 mph, cruising speed 98 mph and range with 182 gallons and 10 per cent reserve of fuel is 230 miles.

Deliveries of the first production S-62's are scheduled for 1959. END

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ANSWER TO WHERE AM I?
(See Page 68)

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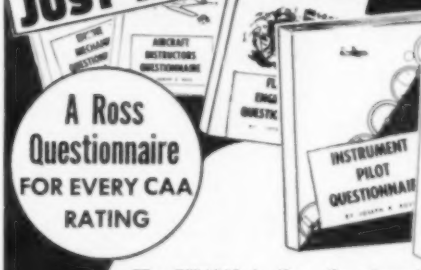

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FLYING CALENDAR

July 29-Aug. 7—Twenty-fifth National Soaring Contest at Bishop, Calif., sponsored by Soaring Society of America. Contact: Lloyd M. Licher, P. O. Box 66071, Los Angeles 66, Calif.

Aug. 3—Muskegon County Dawn Patrol, Muskegon (Mich.) Airport, sponsored by Muskegon Aviation Assoc., Greater Muskegon Jaycees, Muskegon Ch. of Aero Club of Mich., Muskegon C.A.P.

Aug. 3—Annual fly-in picnic at Mulino, Ore., sponsored by Sportsmen Pilots of Oregon. Mulino Chapter furnishes coffee and dessert.

Aug. 7-9—OX-5 Club third annual convention, Statler Hotel, Los Angeles, Calif., James Mattern, Ch.

August 8-10—Sixth Annual Experimental Aircraft Fly-in and Sport Aviation Meet. Curtiss Wright Airport, Mliwaukee, Wis. Everyone welcome. Write: Paul Poberezny, EAA, Hales Corners, Wis.

Aug. 9—Fly-in to Prineville, Ore., for Crooked River Roundup and parade. Bus from airport.

Aug. 10—Pacific City, Ore., Annual Fish Fry, sponsored by the Sportsmen Pilots of Oregon.

Aug. 10—Fly-In breakfast at Hyde Field Airport, Clinton, Md., sponsored by Washington Air Derby Assoc. Ham and egg breakfast, $1.25.

Aug. 10—Fowlerville Dawn Patrol, Newton (Mich.) field, sponsored by the Commercial Club.

Aug. 11-15—National Flying Farmers Assoc. 1958 convention at Hotel New Yorker, New York, N. Y. Teterboro Airport, Teterboro, New Jersey will be used to base NFFA planes. Contact: Exec. Sec'y, NFFA, Municipal Airport, Wichita 13, Kan.

Aug. 14—Ninth International Air Race (for women pilots) sponsored by Fla. Ch. of Ninety-Nines and the Grand Bahama Club, from Welland, Ontario, Canada to Grand Bahama Club, West End, Grand Bahama. Six cash prizes totalling $2,000. This is a handicap, daylight race. For details, contact: Miss Irma Price, 242 S.W. 8th St., Miami, Fla.

Aug. 17—Reed City (Mich.) Dawn Patrol sponsored by the Rotary Club.

Aug. 18-19—Annual Western Regional Meeting of American Astronautical Society, Inc. at Stanford Univ., Dinkelspeil Auditorium, Palo Alto, Calif.

Aug. 18-23—Louisiana Aviation Week featuring East Baton Rouge Parish Sky-O-Rama on Aug. 23, 24. Facilities of Downtown Airport and Ryan Field will feature static displays, precision flying, etc., to show aviation progress in the area.

Aug. 23, 24—Fourth Annual Jaycee Air Fair sponsored by Aviation Comm. of Portland (Ore.) Jr. Ch. of Commerce in conjunction with dedication of new multi-million dollar airline terminal at Portland International Airport.

Aug. 23-24—Second Annual Maine Air Fair at Auburn-Lewiston Municipal Airport, Auburn, Maine, sponsored by Auburn Exchange Club and Lewiston-Auburn Aero Club. Rain dates: Aug. 30, 31. Package including free transportation to Poland Spring Hotel, cocktail party, dinner, entertainment, hotel room, breakfast, lobster cookout costs just $20. Both land and seaplanes accommodated. Contact: Frank Geiger, Gen. Ch., Auburn, Maine, for reservations.

Aug. 24—Northport Dawn Patrol, Clinton Woolsey (Mich.) Airport sponsored by the Pilots Club.

Aug. 24—Fly-in Breakfast. Aircraft displays, entertainment. County-City Airport, Chehalis, Wash.

Aug. 24—Huntingburg (Ind.) Jaycee fourth Annual Air Show.

Aug. 24—Fly-in breakfast to Troutdale, Ore. sponsored by Sportsmen Pilots of Oregon. Then plan to go on the Air Show and dedication at Portland International.

Aug. 24—Fly-in to Nehalem, Ore., for free feed and transportation. Bring your fishing tackle for "Surprise treat."

Aug. 24—Second Annual Fly-in Breakfast at Ukiah (Calif.) Municipal Airport sponsored by Ukiah Sq. 28. CAP, and Redwood Empire Fair and Sports Show.

Aug. 30-Sept. 1—Kentucky Air Tour. For full details, contact: Frank L. Savage, Exec. Vice Pres., Kentucky Jr. Ch. of Commerce, 670 South Third St., Louisville, Ky.

Aug. 30, 31, Sept. 1—Schweizer I-26 Regatta at Harris Hill, Elmira, N. Y. Contact: Jack Wilkins, 763 Hazel St., or Howard Burr, 635 Mt. Zoar St., Elmira, N. Y.

Aug. 31—Fly-in to Salem, Ore., to visit the State Fair. Local Sportsmen Pilots of Oregon will furnish free transportation.

Aug. 31-Sept. 1—Professional Race Pilots Assoc. air races at Fort Wayne, Ind. on a 2½-mile oval course. Total purse: at least $7,000. For details contact: Don Berliner, 19 Hudson Ave., Athens, Ohio.

Sept. 1—Grand Rapids (Mich.) Dawn Patrol, Kent County Airport, sponsored by Kent Pilots Assoc., Jaycees, C.A.P.

Sept. 1-7—SBAC Flying Display and Exhibition, Farnborough, England.

Sept. 6-7—Annual convention of Western States Assoc. of Sheriffs Air Squadrons at Big Bear Lake in San Bernardino County, Calif.

Sept. 6-14—International Aviation Show, New York Coliseum, New York, N. Y.

Sept. 7—Ninth Annual Trophy Race at Lunken Airport, Cincinnati 25, Ohio, sponsored by Greater Cincinnati Airmen, Inc. Beautiful trophies—buffet luncheon. Contact: Margaret L. Berning, Greater Cincinnati Airmen, Inc., 2d Fl., Adm. Bldg., Lunken Airport, Cincinnati 26, Ohio. Rain date: Sept. 4.

Sept. 7—Otsego-Plainwell (Mich.) Dawn Patrol sponsored by C.A.P.

Sept. 7-15—Fifteenth Annual All-Eastern Air show at Municipal Airport, Quakertown, Pa., featuring national fly-in of Antique and Experimental "Home Built" aircraft.

Sept. 17-19—Michigan Aeronautics Conference, Ishpeming, Mich.

Sept. 21—Lansing Dawn Patrol, Davis (Mich.) Airport sponsored by C.A.P.

Sept. 22-24—National Business Aircraft Assoc. annual meeting, Bellevue-Stratford Hotel, Philadelphia, Pa.

Sept. 25—Massachusetts Aviation Conference at Andover Country Club, Lawrence, Mass., sponsored by Greater Lawrence Ch. of Comm., Mun. Airport Commission, Mass. Aero. Commission and Mass. Dept. of Commerce.

Sept. 25-28—Air Force Association 1958 National Convention and Airpower Panorama, Dallas, Tex.

Sept. 26-28—Fall Sectional meeting of North Central Section of The Ninety-Nines, Inc., at Bismark Hotel, Chicago, Ill. Chicago Area Chapter, hostesses.

Sept. 27—Tenth annual Kids Day sponsored by Kiwanis International, USAF, RCAF. Airforce bases in the U. S. and Canada hold open house for children in neighboring communities.

Oct. 1-3—1958 National Airports Conference at Norman, Okla., sponsored by the Am. Assoc. of Airport Executives and the U. of Okla.

Oct. 3-5—Paul Bunyan Conclave, Traverse City, Mich.

Oct. 4-11—Tenth Annual All-Texas Air Tour starts from Temple, Tex., counterclockwise around the perimeter of the state, making 40 stops for Texas hospitality ending at San Angelo with a mammoth western celebration. Write: Texas Air Tours, 307 Walton Bldg., Austin, Tex.

Oct. 6, 7—Champion Spark Plug Company's distributor and executive operator's clinic. Secor Hotel, Toledo, Ohio.

Oct. 8-10—Champion Spark Plug Company's 14th annual Aviation Spark Plug and Ignition Conference. Secor Hotel, Toledo, Ohio.

Oct. 11, 12—Third annual Michigan S.M.A.L.L. race from Sturgis, Mich., to Manistee, Mich., sponsored by Michigan Ch. of the Ninety-Nines, Inc. Mrs. Elsie E. Ferich, Publicity Ch., 3106 Yale St., Flint 3, Mich.

Oct. 27, 28—Fifth Annual East Coast Conference on aeronautical and navigational Electronics at Lord Baltimore Hotel, Baltimore, Md.

Nov. 17-18—Sixth Annual Convention, Society of Technical Writers and Editors, Inc., at the Shoreham Hotel, Washington, D. C.

Nov. 27-30—Snowbird Soaring Meet at Harris Hill, Elmira, N. Y. Contact: Jack Wilkins, 763 Hazel St., or Howard Burr, 635 Mt. Zoar St., Elmira, N. Y.

April 5-10, 1959—Fifth Nuclear Congress at the Cleveland Auditorium, Cleveland, Ohio.

Calendar items must be received at FLYING's editorial offices, 1 Park Avenue, New York 16, N. Y., three months prior to the event.

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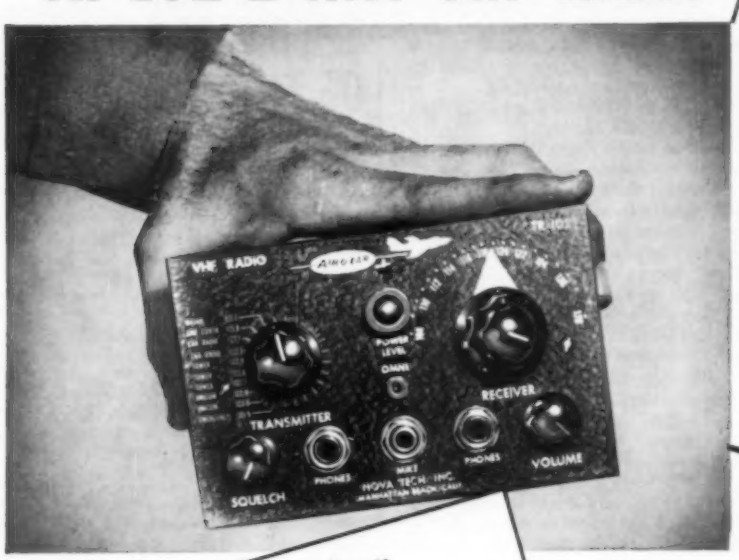

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April 21, 1958

Nova-Tech, Inc.
1721 Sepulveda Blvd.
Manhattan Beach, Calif.

ATTENTION: B. Crist

Gentlemen:

I have received your letter dated April 16, 1958, and would like to submit the following for your information. I am happy to say that I am more than satisfied with the TR-102 I installed recently in my Ercoupe. The weather cleared up in this locality, and I was able to give it a thorough checkout. I left Sacramento Airport and headed south toward Stockton. I checked with tower over Franklin Airport, some 15 miles south, and was almost blasted out of my seat with the reception. I next checked over Lodi, further south, and had to completely close the squelch and used very little volume and reception was wonderful. Over the Stockton Airport, some 40 miles south, I called in again, decreased the volume a little, as the reception was so loud with full volume that it practically burst my eardrums. I flew further south and contacted the tower again over Manteca which is exactly 50 miles approximately south of Sacramento. The reception both ways was more than satisfactory, and my hearing is none too good at best. I still continued until I was almost to Modesto which is approximately 70 miles, and I could still carry on an intelligible conversation with the tower. Having fully satisfied myself, I thanked the tower for their cooperation and returned to base.

I might say that the set is exactly as you checked it. No adjustments have been made here. I feel sure that by installing shielded harness, which is not absolutely essential, it would give me further distance of receiving. You may use this statement in any way you see fit.

Sincerely,

Robert N. Miller

COL. ROBERT N. MILLER

RNM/kh

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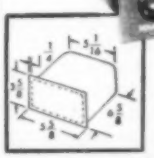

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I Learned About Flying From That!

(Continued from page 50)

them but both looked all right so I started to pattern again, only to receive the red light once more. Now I was really scared, as I expected the motor to quit any second and made up my mind to come in, red light or no red light. This time however, I received the green light and completed the landing.

I taxied up to the flight line and killed the engine. Lyle wasn't there but came in a few minutes. He'd been up in the tower and said they wanted to see me. He also asked if I knew why I'd been given the red light? Right then it dawned on me. I looked across the field, and, sure enough, the tetrahedron indicated I had been flying the wrong pattern. Lyle said if he hadn't gone up and told them about the gas, they would have kept me in the air till I found out what was wrong.

I dreaded every step up to the tower. They said they just wanted to explain their problem to me. Many planes were not paying any attention to the tetrahedron, and they were going to put a stop to it. I told them my mind was so engrossed with the fuel shortage problem, that I didn't think to check the pattern, especially since I had just taken off. They had changed it when the wind died so that pilots need not take off into the sun. The sun comes up directly in line with the runway and, shining on the snow, it is very hard to see until after the first turn. They invited me to come up when they were busy and see some of their problems.

Since then I have visited the tower several times and think every student should do so. Additionally, I never go up without first topping the tanks, as well as double checking the pattern.

In fact, the whole matter of piloting seems to me to sum up in the idea that you fly well and safely so long as you fly with your head. If a beginning pilot doesn't learn that, he doesn't learn anything.

END

J-3 Cub on Tricycle Gear

(Continued from page 46)

effective. The Cub rolled forward on the main gear and soon broke ground—smoothly and without appreciable effort on my part.

In the air the Tricycle Cub handles conventionally. Although I really wasn't aware of it, Krall says the nose gear slows the ship down about five mph. I feel this small penalty is favorably offset by the ground handling and landing advantages. On the first landing I brought the Cub in faster than usual. Expecting a little tussle with a 12 mph crosswind, and not quite sure if the rate of sink was changed, I flew the plane right onto the runway. The three wheels of the gear touched at the same time, and a little forward pressure on the stick kept the Cub on the deck—no bounce or lifting of the windward wing.

On the second landing, I approached at 60 mph, slowed to 50 over the fence and, as the machine settled a little faster than usual, applied back pressure on the stick

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—not quite as much as needed for a stall landing. The Cub assumed a slightly nose-high attitude, settled on the main gear and continued to roll down the runway with the nose gear clearing the ground. As the speed diminished in the landing roll, the nose gear lowered of its own accord, touching the ground shortly before the Cub came to a stop.

I interrogated Krall about installation of the gear. He said he installed the Testerman Model SPM-1. Cost of the installation is $100 for the kit, and $50 for labor. Krall, an A&E, had made his own installations, and in answer to my question of change involved, outlined the following major steps:

1. Engine cowling is removed and engine bolts are loosened. A chain hoist is attached to the engine and supports it while lower engine mounting bolts are removed and replaced with those supplied in the kit. Lower engine mount attachment is filed to clear "vee" attachment.

2. Nose gear is placed in position so that the flat faces of upper vee fittings rest against the firewall, lined up with the two, lower, engine-mount bolts. The engine-mount bolts are pushed into place through the "vee" fittings and into the engine mounts. Then the engine is lowered by the chain hoist. Washers are placed between the engine-mount fittings and the firewall. Then bolts are pushed into place. After this, the bolts are secured with nuts and safetied.

3. It is necessary to cut out two places in the lower engine cowling to clear the legs of the vee assembly. A one-quarter-inch clearing should be maintained around the vee legs when the cowl is finally re-installed.

4. The airplane is hoisted clear of the floor and the main gear removed. Fuselage fittings are modified by drilling and reaming; adapter is installed, and main gear is reversed and re-installed. The shock absorber cabane vee assembly is attached to the adapter in the same manner as on the original installation. Also the shock absorber struts are re-installed in the original way. All bolts are tightened and safetied, and the airplane is lowered on its gear.

5. The tailwheel is removed. The remaining tail wheel leaf spring serves as a tail skid.

The statistics stack up this way:

Conventional: Empty weight—709 pounds: Empty center of gravity—15.4; Useful load—511 pounds.

Tricycle Cub: Empty weight—726 pounds: Empty center of gravity—14.25; Useful load—494 pounds.

In summing up the entire project, Krall feels that, although the J-3 Cub on a tricycle loses a little payload and speed in the air, it does offer many advantages to students. On the basis of the student enthusiasm I found at Yoder Airport, I can subscribe to Tony's evaluation. END

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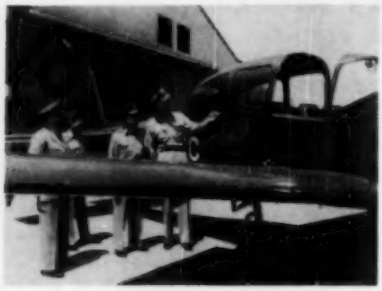
sponsored by Piper Aircraft and Steve Gentle, manager of Martha's Vineyard Air Service at Edgartown. Living facilities and out-of-doors activities—swimming, golf, boating, fishing—are adjacent to the airport. Tri-Pacers and Cubs are available for instruction. A solo ticket will average $200 to $250 on a Tri-Pacer; $125, on a Cub.

THREE OFFICERS of the Fort Leavenworth, (Kan.) Flying Club show off their latest club plane, an L-17 Navion, to their commanding general, Maj. Gen. Lionel C. McGarr (second from right). At right is club president, Army Lt. Col.



F. E. St. John with Lt. Col. Niels Dahl (left) v.p. and second left Lt. Col. C. C. Helena, secretary. The three Colonels are charter members of the club which has a membership of 25—13 student pilots and 12 licensed flyers.

BEECH AIRCRAFT has shifted its advertising business to Bruce Brewer & Co., Kansas City and Minneapolis, according to Phil McKnight, manager of public relations and advertising for Beech. The account was officially taken over by Brewer, July 1.

CAPABLE OF MOVING aircraft weighing from 100,000 to 400,000 lbs. at towing speeds of three to ten mph and unladen, speeds of 10 to 30 mph, this Kenworth towing tractor is designed for economy handling of large jet aircraft

such as the Boeing 707. Built by the Kenworth Truck Co., Seattle, Wash., the vehicle has a turning radius of only 16 feet in a four wheel version; 26 feet 6 inches in two-wheel steering.

DUPONT AIRPORT, Wilmington, Del., site of many pioneering efforts in aviation since its opening in 1927, has been closed down. Its tenants for many years, Atlantic Aviation has transferred its flight school and operations to larger facilities at the New Castle County airport. In its past Dupont Airport played an important part in the growth of the billion dollar aviation industry and played host to many aviation celebrities. All American Engineering has purchased all buildings from Atlantic and additional land to enlarge their facilities for manufacture of energy absorption devices.

HAVING RECEIVED CAA approval on cabin pressurization tests for the "Centaurus," its Lockheed PV-2 conversion, Oakland Airmotive, Oakland (Calif.) Int'l Airport, is ready to go ahead with production of this 280 mph executive aircraft. Formerly the Navy "Harpoon," the Centaurus has a 2,000-mile range, a useful load of more than 10,000 lbs. Priced around $200,000, when pressurized approximately $150,000 will be added to the customer's cost.

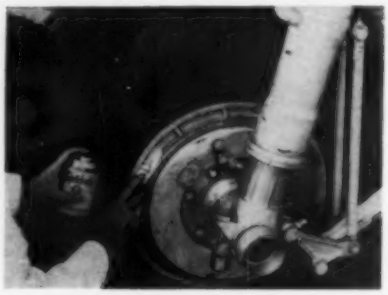
FLOAT TESTED AT Grand Lake, Okla., and ski tested at Minneapolis, Minn., the Cessna Model 175 is now officially approved as both a float and ski plane. Floats are especially-designed Edo 338-2200's. The skis are Federal, wheel re-

placement type which require no special fittings; A-3500A for the main skis and NA-1200A for the nose ski. Floats and skis may be ordered from their respective manufacturers or from Cessna dealers or the Cessna factory.

"PATH OF FLIGHT" out of print for sometime is again available to the public after a major revision to bring it abreast of the latest developments in air navigation, airways aids and flying under VFR rules. Always a CAA "best seller" the basic purpose of the publication is to provide material on elementary navigation for study by applicants for private pilot certificates. Price is 65 cents from GPO, Washington 25, D. C.

FIRST AWARD of Monsanto Chemical Co's. Aviation Safety Award—an 18-inch tall bronze figure symbolizing man's efforts to safeguard flight—was won by Jerome Lederer, New York, N. Y., director of Flight Safety Foundation Inc., and the Cornell-Guggenheim Aviation Safety Center. Presentation was made by Leroy Whitman, editor and publisher of the ARMY-NAVY-AIR FORCE JOURNAL at recent Aviation Writers Convention in Houston, Tex.

MAGNAFLUX of Chicago has announced an important safety improvement in its Spotcheck dye penetrant inspection materials. Made with the safer chlorinated hydrocarbons the new Spotcheck now available in nonflammable or very-



high-flash-point formulas, comes in either pressure spray cans or bulk. It provides a convenient spray-can dye inspection method for locating surface cracks, seams, porosity and other defects in almost any solid material.

LAMINATED PLASTIC sheets which provide a simple way to preserve important personal identification cards, licenses and photos, are offered by Natco Co., Alfred, Me. in do-it-yourself kits. Called "Plain-Vu," the small kit holds 10 (3"x4") plastic sheets at the price of $1. Larger kits are available.

UNDER THE TRADE NAME of "Bird Dog RDF-2" Aircraft Specialty Lines, Inc., is marketing a new radio compass designed for the lightplane pilot. Priced at $495, the unit includes an 8-tube superheterodyne tuner; vibrator-type power supply; an indicator with easy to read right-left needle, plus a

ferrite loop. Total weight is 9.14 lbs. The Phoenix, Ariz. firm claims the compass is unique in that it can receive over longer distances at minimum altitude. Its tuner is capable of receiving radio range stations and beacons from 200 to 450 kc and standard broadcast bands from 550 to 1600 kc.

BY USING NITROGEN, an inert gas, in lieu of air for inflation Goodyear Tire and Rubber Co., has found that airplane tires, made of either synthetic or natural rubber, are feasible for future atomic-powered aircraft. Based on radiation tests at Goodyear's laboratory in Akron, Ohio, and at the Oak Ridge, Tenn., atomic plant, the company states that development of such tires will be accomplished without difficulty.

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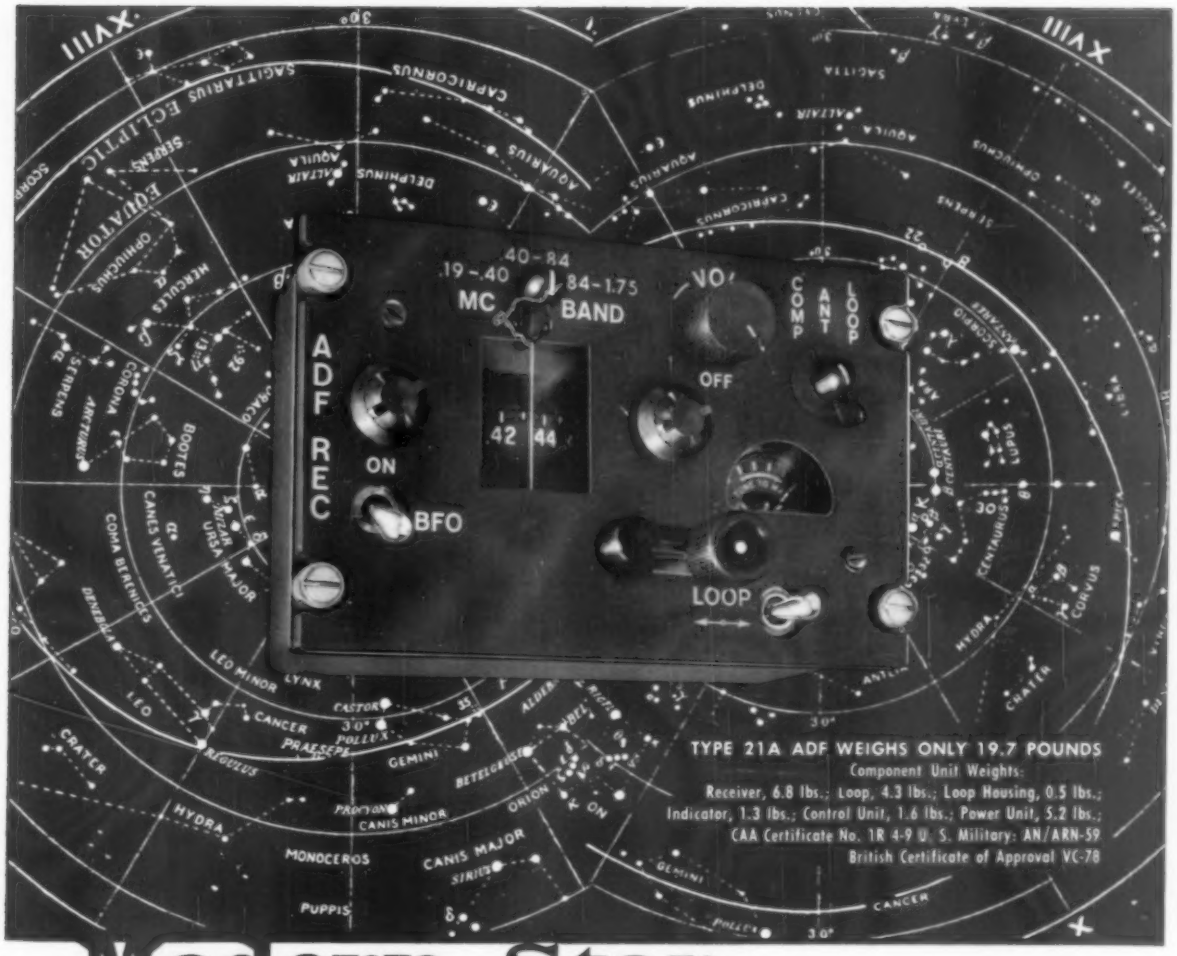

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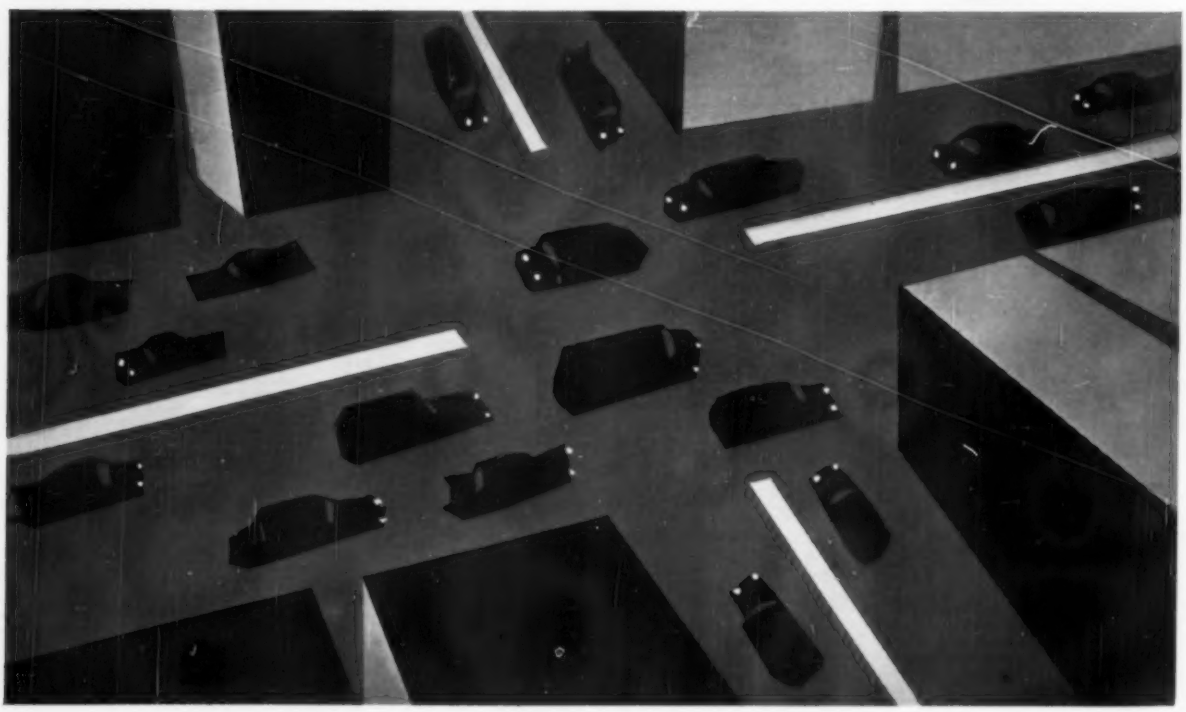
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